The Communicator

January-February 2024

SARC

The Bi-monthly Journal of Surrey Amateur Radio Communications

PUBLICATION CONTACTS

COMMUNICATOR & BLOG EDITOR John Schouten VE7TI
communicator at ve7sar.net

SARC TELEPHONE 604-657-8753

CORRESPONDENCE 14689 – 72A Ave,
Surrey, BC V3S 9L8
SARC at ve7sar.net

CONTRIBUTING EDITORS John Brodie VA7XB
Kevin McQuiggin VE7ZD/KN7Q
Larry Bloom VE7LXB

The Communicator is a free electronic periodical published by Surrey Amateur Radio Communications in Surrey, B.C., Canada for our members and non-members alike. All rights are reserved.

Our article reprint policy is on page 107

Issues appear bi-monthly, on odd-numbered months, for area Amateur Radio operators and beyond, to enhance the exchange of information and to promote ham radio activity.

Contributions of articles and photos are welcome.

During non-publication months we encourage you to visit the Digital Communicator at **ve7sar.blogspot.ca**, which includes recent news, past issues of ***The Communicator***, our history, photos, videos and other information.

To subscribe, unsubscribe or change your address for e-mail delivery of this electronic journal, notify **communicator @ ve7sar.net**

If you find ***The Communicator*** worthwhile, regular readers who are not SARC members are invited to contribute a donation towards our Field Day fund via PayPal.

SARC maintains a website at **www.ve7sar.net**

DEPARTMENTS

The rest of the story **4**

VE7NFR pico balloons **10**

News you can lose —Ham humour **13**

Radio ramblings **14**

SARC's project update **28**

Basic soldering workshop **35**

Icom User Group **37**

Daniel's workbench **42**

Amateur TV **64**

Around the GOTA corner **70**

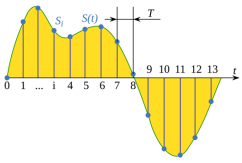
Issue columnists **72 - 86**

Back to basics **88**

SARC & SEPAR news **96 –114**

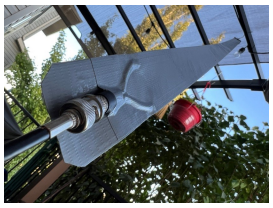
QRT **116**

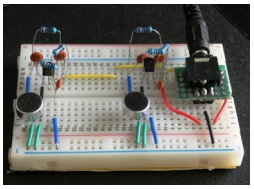
IN THIS ISSUE



In his Radio Ramblings this issue, Kevin dissects digital radio and provides insight into its inner workings.

Ben Eadie VE6SFX joins us with an antenna column. This issue build a Duck tape J-pole antenna.





Daniel Romila is back with several projects and information on a variety of electronics.

…and so much more!

QSK?

Do you have a photo or bit of Ham news to share? An Interesting link?

Something to sell or something you are looking for?
eMail it to communicator at ve7sar.net for inclusion in this publication.

Our wishes for a happy, healthy and prosperous New Year! We have another full issue for you to start 2024.

The recent passing of World War II spy Phyllis "Pippa" Latour provides us with a glimpse of her activities in France. She used needle crafts and knitting needles to create Morse code messages that she passed to the Allied forces. This one sounds like a future book/movie plot.

Kevin McQuiggin takes a deep dive into digital radio in his Radio Ramblings column starting on page 14. It is a fascinating subject and the way of the future as more and more digital equipment shows up in our shacks.

Daniel VE7LCG has another set of articles, including some useful microphone upgrades for those with Chinese built handhelds.

Our complement of columnists is joined by Ben Eadie VE6SFX. Ben is an avid antenna builder and he came to my attention after constructing a 70cm gap antenna from a 1 lb can of tinned ham. Spare the ham jokes… it really works.

I received feedback from last issue where I asked if there was an appetite for a series of articles on the popular Icom transceivers including the 7300, 7610, 9700 and others that are compatible. As a result of the replies I have started with an interesting and simple project for this issue.

Of course there is plenty of SARC club news toward the back of The Communicator. Enjoy!

73,

~ John VE7TI, Editor
communicator@ve7sar.net

This Month's Cover…

Kevin VE7ZD/KN7Q is pictured at Arizona State University where he attended a GNUradio conference this past summer. Kevin will present on GNUradio at our January 13th Zoom meeting. His Radio Ramblings column this month dissects digital radio. A fascinating read.

Be at war with your vices, at peace with your neighbors, and let every new year find you a better man—*Benjamin Franklin*

On the Web

ve7sar.net

Between Communicators, watch your e-mail for news, announcements of Amateur Radio events, monthly meetings and training opportunities.

Click the links below to follow our presence on the web and social media:

SARC Blog
ve7sar.blogspot.ca

Twitter
@ve7sar

FaceBook
SurreyAmateurRadio

Our YouTube Channel
SurreyARC

SARC Photo Albums
Web Albums

or

tinyurl.com/SARCphoto

The Rest Of The Story…

Knitting CW

Phyllis Latour

Phyllis "Pippa" Latour MBE (8 April 1921 – 7 October 2023) was a South African-born agent of the United Kingdom's clandestine Special Operations Executive (SOE) organisation in France during World War II. The purpose of SOE was to conduct espionage, sabotage and reconnaissance in occupied Europe against the Axis powers, especially Nazi Germany. SOE agents in France allied themselves with French Resistance groups and supplied them with weapons and equipment parachuted in from England. Latour worked as a wireless operator in Normandy from 1 May 1944 until August in the same year.

Latour's father, Philippe, was a French doctor and married to Louise, a British citizen living in South Africa, where Phyllis was born in April 1921. Her father died three months later during local conflicts in the Belgian Congo, and her mother remarried three years later. Her stepfather was a racing driver, and would let his new wife race his automobiles as well. During one such race, her mother's car malfunctioned and she was killed when the car crashed into a barrier. Latour then went to live with her father's cousin in Jadotville in the Belgian Congo.

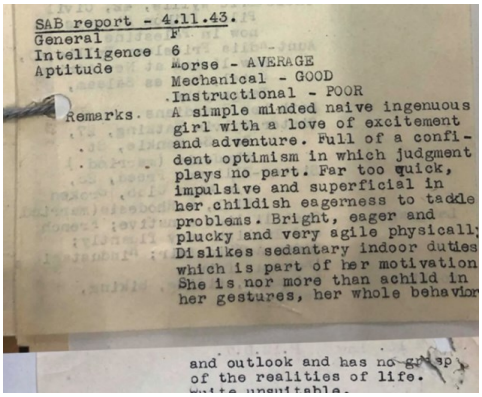
She spent spare time on "safaris" with her guardian, traveling around the country to stop ivory smuggling. Her training for SOE noted her constant discussions about the Belgian Congo. Phyllis spoke English, French, some Arabic, Swahili, and Kikuyu. At 16, she attended boarding school in Kenya.

Latour moved to England in May 1939, and joined the Women's Auxiliary Air Force (WAAF) in November 1941 (Service Number 718483) as a flight mechanic for airframes and balloon opperator. Because of her fluent French, however, she was immediately asked

by SOE to become an agent, and went through vigorous mental and physical training. She joined the SOE in revenge for her godmother's father having been shot by the Nazis and for her godmother's suicide after being imprisoned, officially joining on 1 November 1943 and was commissioned as an Honorary Section Officer.

A Yearning for Adventure

Latour's wartime SOE file, released by the National Archives, outlines her actions and paints a vivid picture of one of the little-known heroines of the war and of her life as a World War Two spy behind enemy lines.


SAB report - 4.11.43.
General F
Intelligence 6
Aptitude Morse - AVERAGE
Mechanical - GOOD
Instructional - POOR
Remarks. A simple minded naive ingenuous girl with a love of excitement and adventure. Full of a confident optimism in which judgment plays no part. Far too quick, impulsive and superficial in her childish eagerness to tackle problems. Bright, eager and plucky and very agile physically. Dislikes sedantary indoor duties which is part of her motivation. She is nor more than achild in her gestures, her whole behavior
and outlook and has no grasp of the realities of life.

Reports from Phyllis's trainers were often less than glowing

However, her files reveal a yearning for more adventure, leading her to train for SOE in the autumn of 1943. Initial reports described her as "simple-minded, naïve, ingenuous," with a dislike for sedentary duties. Trainers often underestimated female agents, but Latour's exceptional service in France contradicted her initial evaluations.

Behind Enemy Lines

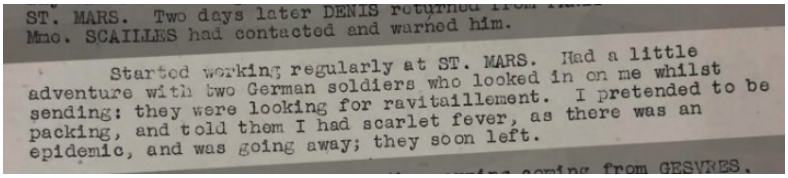
Phyllis arrived in France on May 1, 1944, working in the area of Caen and Vire with another agent. The Gestapo learned of their presence, and after encountering a German vehicle full of Allied parachutes, they had to relocate to a resistance base near Nantes. Her reports detail constant movement without a change of clothes, reflecting her eagerness to serve.

Small of stature, Latour posed as Genevieve, a teenage girl whose family had moved to the region to escape the Allied bombing. She rode bicycles around the area, selling soap and chatting with German soldiers. In the summer of 1944, in a village in German-occupied western France, this slender young woman with dark hair and grey-green eyes sat in a building with a wireless set, tapping out messages in Morse code that she transmitted urgent messages back to London.

The French resistance in the area sabotaged key transport links, disrupting German forces as they fought the Allied advance. They required supplies dropped by air from Britain and aerial support. Genevieve's messages contained vital intelligence from inside enemy territory, providing precise locations for the RAF to bomb and where to drop equipment.

Encoding

She encoded and transmitted the de Baissacs' messages to SOE headquarters, transmitting by using one-time codes printed on a piece of silk she concealed by wrapping it around a knitting needle that was inserted into a flat shoelace, which she used to tie up her hair, and would translate using Morse code equipment. She was searched on several occasions, and at one point was brought in for questioning but she was released. Latour's 135 coded messages helped guide bombing missions to enemy targets. She had several close shaves while in France. Once, as she typed out a transmission two German soldiers opened the door looking for food. Calmly she closed up the wireless set, pretending it was a case she was packing, while telling them she had scarlet fever – which had been sweeping the area – and said she had to get out of the village. The soldiers left quickly.


ST. MARS. Two days later DENIS returned from [illegible]
Mme. SCAILLES had contacted and warned him.

Started working regularly at ST. MARS. Had a little adventure with two German soldiers who looked in on me whilst sending: they were looking for ravitaillement. I pretended to be packing, and told them I had scarlet fever, as there was an epidemic, and was going away; they soon left.

coming from GEVRES.

An extract from Phyllis's field report, in which she noted being found by German soldiers

This was one of several close calls for Genevieve, working behind German lines was incredibly dangerous, but she never lost her nerve, earning her the citation for the MBE at the war's end.

“I always carried knitting because my codes were on a piece of silk—I had about 2000 I could use. When I used a code I would just pinprick it to indicate it had gone. I wrapped the piece of silk around a knitting needle and put it in a flat shoe lace which I used to tie my hair up,” she told New Zealand Army News in 2009. “I can remember being taken to the station and a female soldier made us take our clothes off to see if we were hiding anything. She was looking suspiciously at my hair so I just pulled my lace off and shook my head. That seemed to satisfy her. I tied my hair back up with the lace-it was a nerve-wracking moment.” *[see the sidebar next page],* Phyllis carried out transmissions in the few weeks she was in France, moving to open fields as the Americans advanced and German-occupied farms became inaccessible.

Phyllis was awarded the Legion d'Honneur medal by the French ambassador to New Zealand in 2014

In August, she contacted the US forces but was initially taken prisoner until her identity was confirmed. Back in Britain, Phyllis sought other fieldwork opportunities, avoiding a return to WAAF. Despite initial dismissive reports, her skills improved, especially in pistol use and parachute jumping.

Phyllis volunteered for a mission to Germany, undergoing intensive training with positive reviews. However, the Allies' rapid advance meant she was never sent on this second mission. She remained in England, facing severe nervous strain after the collapse of Germany.

Return to England

In December 1944, a senior officer noted Phyllis's dissatisfaction with SOE's treatment. She sought alternative employment, expressing her frustration with the lack of support from SOE. In June 1945, notes highlighted her severe nervous strain since Germany's collapse. The Air Ministry's resident psychiatrist recommended her immediate release from WAAF, urging her return to South Africa.

In September 1945, Phyllis was awarded an MBE, acknowledging her daring and courage. After the war, many former SOE agents struggled to adjust to post-war life, lacking support for their exceptional field skills.

Phyllis married and lived in various countries before settling in New Zealand. After marriage, she became known as Pippa Doyle, moved to New Zealand, and rarely spoke about her wartime career. In 2014, she received the Legion d'Honneur, France's highest decoration

Phyllis Latour was the final surviving member of the 39 female secret agents who served in Sir Winston Churchill's "secret army" in France. She passed away at the age of 102 this year.

And that is her story.

~

Side bar…

About that knitting

DURING WORLD WAR I, A grandmother in Belgium knitted at her window, watching the passing trains. As one train chugged by, she made a bumpy stitch in the fabric with her two needles. Another passed, and she dropped a stitch from the fabric, making an intentional hole. Later, she would risk her life by handing the fabric to a soldier—a fellow spy in the Belgian resistance, working to defeat the occupying German force.

Whether women knitted codes into fabric or used stereotypes of knitting women as a cover, there's a history between knitting and espionage. "Spies have been known to work code messages into knitting, embroidery, hooked rugs, etc," according to the 1942 book A Guide to Codes and Signals. During wartime, where there were knitters, there were often spies; a pair of eyes, watching between the click of two needles.

When knitters used knitting to encode messages, the message was a form of steganography, a way to hide a message physically (which includes, for example, hiding morse code somewhere on a postcard, or digitally disguising one image within another). If the message must be low-tech, knitting is great for this; every knitted garment is made of different combinations of just two stitches: a knit stitch, which is smooth and looks like a "v", and a purl stitch, which looks like a horizontal line or a little bump. By making a specific combination of knits and purls in a predetermined pattern, spies could pass on a custom piece of fabric and read the secret message, buried in the innocent warmth of a scarf or hat.

A knitting pattern, to non-knitters, may look undecipherable, and not unlike a secret code to begin with. This could cause paranoia around what knitting patterns might mean. Lucy Adlington, in her book Stitches in Time, writes about one article that appeared in UK Pearson's Magazine in October 1918, which reported that Germans were knitting whole sweaters to send messages—perhaps an exaggeration.

"When the German authorities carefully unraveled such a sweater, the story went, they found the wool thread dotted with many knots. By marking a vertical door frame with the letters of the alphabet, spaced an inch apart, the knots could be deciphered as words by measuring the yarn along this alphabet and marking which letters the knots touched." Adlington writes, adding that the magazine described this as "safer, and not apt to be detected." As with many things spy-related, getting the proof and exact details on code knitting can be tricky; much of the time, knitters used needles and yarn as a cover to spy on their enemies without attracting suspicion. Knitting hidden codes was less common.

The Pearson's account of code knitting seems a bit convoluted, but the rumors were not pure fantasy. Because women were encouraged to knit socks, hats, and balaclavas for soldiers during many conflicts, including the American Civil War, and the World Wars, knitting and textile work was a common sight—and one that could be easily used to the spy's advantage. In Writing Secret Codes and Sending Hidden Messages, Gyles Daubeney Brandreth and Peter Stevenson note that after Morse Code was invented, it was soon realized that string or yarn suit it well. And "an ordinary loop knot can make the equivalent of a dot and a knot in the figure-eight manner will give you the equivalent of a dash."

~

Innovating Ham Radio

The Duck Tape J-Pole Antenna

by BEN EADIE VE6SFX

Ben Eadie VE6SFX is an avid antenna buider who lives in Alberta, Canada. Ben will be sharing some of his creations in this and future issues of The Communicator.

The new year brings us a new feature.

In the ever-evolving world of amateur radio, innovation and creativity are key. Ham operators constantly seek new ways to enhance their experience, often delving into the realm of DIY projects. One such innovative venture is the creation of a J-Pole antenna using unconventional materials: duck tape and copper foil tape. This project not only challenges traditional antenna-making methods but also offers an affordable, lightweight, and portable solution for ham radio enthusiasts.

The Idea

The concept of a duck tape J-Pole antenna emerged from the need for a cost-effective, easy-to-build, and portable antenna. Traditional J -Pole antennas, typically made from copper tubing, are effective but can be expensive and cumbersome. This project was inspired by John Portune (W6NBC), who has extensively explored foil antennas. The challenge was to create an antenna that maintained the essential characteristics of a standard J-Pole but was simpler and more accessible.

Building the Antenna

Materials: The primary materials used were copper foil tape and duck tape. Copper foil tape is affordable and readily available, often used in gardening and electronics.

Construction: The antenna was constructed by laying two pieces of duck tape face-to-face, creating a non-sticky surface. The copper foil tape, acting as the antenna element, was then applied to this surface. The dimensions and measurements for the J-Pole were based on standard calculations, easily found online.

Tuning and Adjustments: One of the advantages of this design is the ease of tuning. Adjustments to the length of the antenna elements could be made simply by adding or removing pieces of the copper foil. Additionally, the feed point of the antenna was determined using movable terminals held by magnets, making it easy to fine-tune for optimal performance.

Testing: The completed antenna was tested for performance. The results were impressive, with clear transmission and reception, proving the concept's viability.

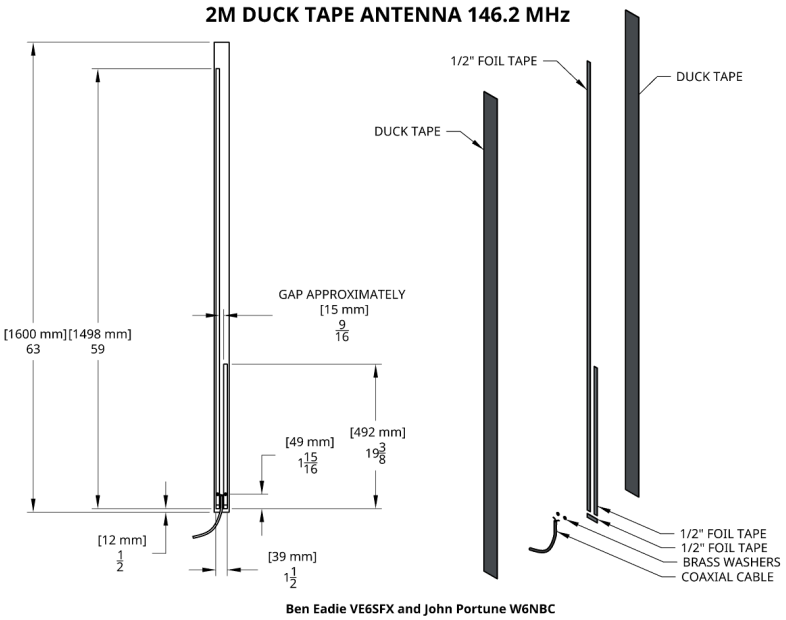
Advantages

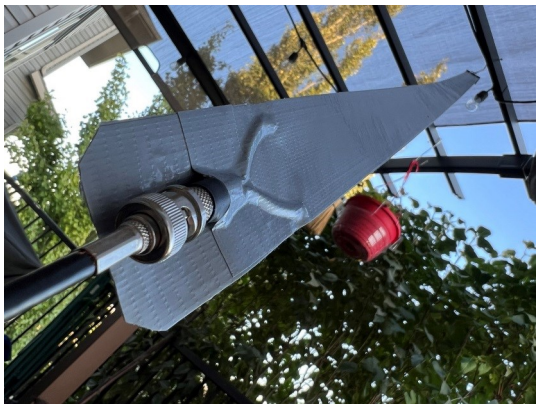
The duck tape J-Pole antenna offers several advantages:

Cost-Effective: The materials are inexpensive compared to traditional copper tubing

Lightweight and Portable: The antenna is extremely light and can be rolled up for easy transport, ideal for field operations. Ease of Adjustment: Fine-tuning the antenna is straightforward, allowing for quick adjustments in the field. Innovative Approach: This project encourages thinking outside the box, using everyday materials in ham radio applications.

The duck tape J-Pole antenna project exemplifies the spirit of amateur radio – innovation, experimentation, and a DIY ethos. It opens up new possibilities for ham radio enthusiasts, especially those new to the hobby or operating on a budget. This project is a testament to the community's ingenuity and a reminder that effective solutions don't always require expensive or conventional materials.As we continue to explore and innovate within the world of amateur radio, projects like the duct tape J -Pole antenna serve as inspiration. They encourage us to experiment and learn, pushing the boundaries of what's possible in our fascinating hobby. Check out the video on this at https://youtu.be/d5itl1uWGtU





73,

~ *Ben Eadie VE6SFX*

Duck tape history

FWIW the true name is duck after the cloth (duck) they used to make the tape from originally in WWII for sealing ammo boxes. For a bit of duck history, see YouTube: https://youtu.be/9FaDI1i8ijs?si=XSfYPUkktUw2NL. This is the origin and why duck is more common. Duct is not all wrong, but for history buffs it is an important distinction.

VE7NFR Pico-Balloons

Nifty functionality

by ADRIAN STIMPSON VE7NZ

- No Meetings
- No Dues
- No Politics

https://www.ve7nfr.com

North Fraser ARC launched our Remembrance Day 2023 Super High Altitude Balloon Launch with APRS & Cross-Band Repeater, launched at 9:00 AM Pacific, November 11th 2023.

The Super High Altitude balloon was weighted and filled with Hydrogen with an expectation of reaching 33,000 M and a flight to the Southern Interior of British Columbia. Super High Altitude balloons rise until they burst, this particular balloon had a burst diameter of a little over 8M. Prediction software which takes into consideration all factors, including winds at different elevations, suggested a landing on the East side of Okanagan Lake across from Peachland, British Columbia.

The balloon was fitted with APRS as VE7NFR-11 and a TYT Handheld with crossband repeater functionality and launched right on time at 9AM with an expected flight time of about an hour and a half from launch to burst to ground fall via parachute. Despite days of testing and significant design choices the APRS failed anyway not long after launch over Harrison Lake however the balloon continued to fly and the repeater worked impeccably. The balloon continued to fly and, as per prediction, made its way towards the Okanagan. Our chase car comprised of Greg VA7TD, Lloyd VE7LGP & Gary VE7IFA headed for the expected landing area. After the balloon burst and landed safely with it's parachute, Rob VE7FU was reporting S9 signals in Peachland. The Chase car and a couple locals Doug VE7VZ & Gary VE7GCP very quickly narrowed down the location to the Crescent Beach area just North of Summerland, probably between the highway and

the lake with a full scale reading with no antenna and just their thumb on the antenna jack. Unfortunately as the searchers narrowed it down to the last square kilometer or so the transmitter went silent as the batteries were finally spent. The new tribe then tried a drone and binocular search and they had the foresight to let a few land owners in the zone know about the payload and be on the lookout for it.

We have some hope that the package may be recovered as it is in an inhabited, agricultural area but so far this has not happened.

Hams from all over our region managed to work each other or just listen to the cross-band repeater in flight with notable stations being KI7SBE in Dalton Gardens, Idaho, N7RLV Vashon Island, Washington (SW of Seattle). Several Vancouver Island and Gulf island stations were heard as well. It was an easy QSO for anyone in the Lower Mainland Fraser Valley at launch and the same for the Lake Country Hams just before balloon burst.

We are hoping to launch another balloon of this type in the New Year, the costs are mounting we are into the thousands of dollars but will continue. We have had many offers of help so we started a Go Fund Me for those that care to send us a little encouragement.

~ Adrian VE7NZ

The balloon launch was a great experiment. Many of you worked the cross band repeater and can be heard on the recording and list of call signs in the recording's description (If I missed anyone, just let me know and I'll update).

Many of you said you'd like to see another launch and have offered to support it with a donation. Scott, me, Steve (VE7SLZ) have spent a lot of money this year getting this far but would like to do one or two more experiments and improve on the results (make sure the APRS is more reliable next time, fix some of the kerchunking issues, maybe fly even higher, etc) and will be able to do so with support from anyone that is happy to contribute (If you have already, thank you!).

We also plan to do at least one more "pico-balloon" launch with a new balloon that has been recommended to us, with the goal of hopefully lapping the planet this time. You will be able to follow this on WSPR.

More details on the experiments so far, link to the audio from last week, and the go-fund-me link can be found at:

www.ve7nfr.com/pico-balloons

Thanks again everyone

~ 73 de Adrian VE7NZ.

Page 12

News You Can't Lose

Field Day results are in

SARC/SEPAR is #1 in Canada, #3 overall in 2F

News you can't lose… well, at least for SARC and SEPAR members. This year for Field Day, the ARRL gave emphasis to "Get On The Air" stations and SARC decided to give it a priority due to the bonus point potential. Although our GOTA participation has been minimal in past years, in no time we had a motivated group of new Amateurs backed by the full support of our club Directors. Beginning at 11 am PST, our GOTAs began transmitting out of the SEPAR trailer using an IC-7610 transceiver graciously lent to us by Icom.

2F

Coventry EMA
KC1CUE (+N1YNI)
1,081 2 20 7,199 RI
Bullitt ARS
KY4KY (+W4KBR)
1,446 2 25 6,156 KY
Surrey AR Comm.
VE7SAR (+VE7HME)
1,082 2 30 6,048 BC

The IC-7610 is an HF (short wave) transceiver, and one of the high-end models in the marketplace. For the next 24 hours, we ran, we pounced, and we spun the dial on the 15, 20, 40 and 80m bands, utilizing our 110-foot "Bigfoot" mobile tower with a TH-7 Tribander – a TH-7DX, 7-element, broadband Tri-Band Beam for 10, 15 and 20 metres. Given their lack of HF experience, we had one new Amateur transmitting while another logged. After an hour, the operator took a break, the logger took the operator's place, and another GOTA sat in the logging chair. I was amazed at how quickly the new Amateurs picked things up. Our biggest issue was convincing them to relinquish the mic! Exhaustion set in by 11 am on Sunday morning, but we knew that we had accomplished something special.

Well, the results are in! Our GOTA and regular club QSOs were combined in the 2F category and we came FIRST in Canada and THIRD overall!

Congratulations to: Doug De Jong, VE7JDJ, Lesley Verhulst, VE7CMI, Katrina Reynolds, VA7WBT, Dale Burghall, VE7LWT, Mike Porisky, VE7YEG, "UB" Adabi, VE7UBZ, Ernie Symchych, VE7ODK, Alex Sevostiyanov VA7PVC, Dmitry Sevostiyanov, VA7DVO, Larry Bloom, VE7LXB, and Manvir Judge, VA7BKI, for their efforts and enthusiasm. Thanks also to GOTAs Aravind, De and Gary who visited to cheer us on.

We know that we can't compete as GOTAs next year, but we're confident a fresh crop of new Amateurs will do us proud at Field Day 2024.

73,

~ Larry VE7LXB

Page 13—News You Can Lose

The Lighter Side of Amateur Radio

AMSAT Proposes Solution to Global Warming

AMSAT is making a proposal at the upcoming "United Nations Climate Change Conference on Global Warming" for the launch of 500,000 Low Earth Orbit Satellites (LEOs). The proposal will provide unprecedented communications capabilities for ham radio operators while also solving global warming (known as "Climate Change" for those who remember when Canada used to be a cold country).

Hams have been launching LEOs for many years, but never on the scale of companies like StarLink, who have around 5,000 LEOs providing worldwide internet service.

But now AMSAT proposes a bold new vision: launching 500,000 satellites that will provide not only a reliable emergency communications network, but will also block enough sunlight to reduce the Earth's temperature back to the pre-climate change conditions.

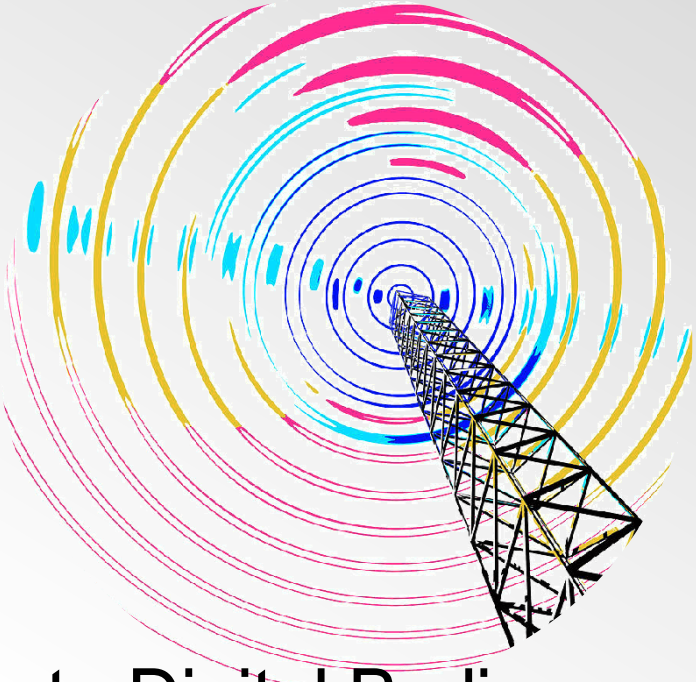
"The plan is genius," said Professor H. D. Mellon, a noted climate change expert. "Finally someone has realized the real source of global warming is the Sun. It must be blocked. I don't know why we never thought of this before!"

Dubbed "sunglasses for the planet" the first 100,000 satellites will be launched early in the new year to provide the first level of protection in time for summer. The remaining sunlight that gets through will be reflected back to space, where it belongs, by the metal 10 GHz antennas used by hams on the ground.

The Climate Change Conference is expected to approve the proposal at next week's session in Hawaii, once all delegates have arrived by plane.

~ Reporting from live from Hawaii,
Adrian VE7NZ/KH6

Radio Ramblings



Introduction to Digital Radio

by KEVIN McQUIGGIN VE7ZD / KN7Q

Kevin VE7ZD/KN7Q is active in EME, meteor scatter and much more. He lives on Vancouver Island

There are a lot of us with little to no experience in digital radio. "Digital Signal Processing" (DSP) and these new "Software-Defined Radios" (SDRs) can sound very technical for those ops without experience in the area. All the new rigs from the major manufacturers have "gone digital", so it is fitting to spend some time talking about how digital radio differs from classical analog radio technology.

This month let's look at an introduction to digital radio specifically for those ops still working in the analog world who are curious about how digital radio works, and describe how it differs from analog radio systems.

You'll find that it is not that different after all! [1]

All Radio is Analog!

There's a common misconception about "digital radio" that makes it seem foreign to everything we have learned as hams about electromagnetic radiation. This can represent the starting point of some ops' confusion. Let's look at this.

Electromagnetic radiation is a physical phenomenon that is inherently "analog". All radio signals are electromagnetic (EM) waves (i.e. they are

composed of transverse electric and magnetic fields). There is no way to repackage a radio signal in any other form!

Digital radio cannot somehow be "digital" when the signal leaves your antenna. Digital radio refers to the way that radio signals are processed within a transmitter or receiver. An analog signal received from your antenna must be digitized – converted to digital form – before any digital stages in the radio can operate on the signal. Vice versa for digital signals leaving the radio to be transmitted.

At the antenna – the point where "the rubber hits the road" – all signals must be in an analog form. Even fully digital receivers and transmitters therefore MUST include two converters:

- One converter that translates the received analog EM radiation to digital form; and
- A second converter that translates the digital representation of the signal in the radio to an EM analog signal, so that it can be transmitted.

The first type of converter is commonly referred to as an "ADC" (analog-to-digital converter); the second type as a "DAC" (you guessed it – digital-to-analog converter). ADCs and DACs form the "front end" of every digital radio.

Now when you hear these terms, you'll know what the speaker (or the literature) is talking about.

A digital radio (or a "software-defined radio": more on terminology below) is thus completely dependent on these "analog to digital" and "digital to analog" converters for its performance. A poor ADC or DAC will limit the digital radio's performance.

Those ops (and radio manufacturers) who say that "analog radio is dead" are therefore misinformed (or deliberately mis-stating the facts). While all signal processing is now done digitally, physics dictates that EM signals "on the air" are always analog.

Digital Radio?

Now that we have cleared that up, we should spend a bit of time talking about what "digital radio" is and how it can improve the performance of radio systems.

There are lots of ops who doubt the performance of digital signal processing (DSP) and think that the conversion of analog signals at the antenna to digital form (via the ADC) degrades the quality of the received signal. This is NOT the case: as long as the digitization of the EM signal through the ADC is done properly (see below), then the digital signal contains enough data to represent (and even recreate) the analog signal perfectly! Not "roughly" or "approximately" – but perfectly!

The digital form of signals consists of a stream of numbers. This number stream represents the original analog signal and can be used to analyze and recreate the original analog signal.

Why convert analog signals from the antenna to digital? It's because once the signals are represented in numerical form, mathematical techniques can be used to perform all the common operations required in a radio system:

Operation	Summary in Digital Realm
Demodulation	Recovering original data (e.g. audio for speaker) from the digital signal
Modulation	Converting base data (e.g. audio from mic) to a digital stream of numbers suitable for transmission
Amplification	Increasing magnitude of the signal in the data stream
Filtering	Implementation of low, high, bandpass, notch filters on the numeric data stream
Mixing	Combining two or more digital signals

Table 1 looks unremarkable. Historically, radio systems performed all these functions using analog components. Filters were built using networks of inductors and capacitors; amplifiers used vacuum tubes and later, transistors; mixers were built using various combinations of discrete components. Modulators and demodulators were complex circuits built from possibly a dozen or more analog components.

Radios built using these technologies worked well – so what's the advantage of digital radio?

Here are two problems with analog radio:

1) Radios built using analog components are subject to the accuracy of the components.

Resistors, capacitors, and inductors have tolerances: typically, a percentage plus or minus from their specified values. That 47K resistor will never be exactly 47000.000000 ohms. The values of these components can change over time or be affected by operating conditions such as temperature change. An old resistor, for example, can experience a value change greater than 30 percent. The accuracy of circuits built from these components thus is not exact and can vary over time.

Additionally, components of the exact values required are never available commercially. Your calculations for a filter may call for an inductance of (for example) 3.456921146 microhenries at a certain point in the filter. However, there is no component manufactured with this exact value, so you will need to select a standard value of (for example) 3.3 or maybe 3.6 microhenries for the coil.

Each of these approximations (for all of the analog components: resistors, capacitors, and inductors) introduces error into the circuit's performance. Active devices such as transistors differ from each other and from "book" specifications as well.

The cumulative effect of all of these errors is that the resulting device may "work", but the analog circuit will be, at best, only a rough approximation of all of the exact component values required. Additionally, as each circuit component ages, or the ambient temperature changes, the performance of the analog circuit will change.

This is undesirable behaviour. Analog radio design is a task of best approximation.

2) An analog radio is built of discrete components for a single purpose: consequently, it can perform only the functions for which it was originally designed.

An analog handheld FM transceiver (my old Icom IC-02AT comes to mind) cannot be used as an SSB receiver, or as an HD television transmitter, or a cellular telephone repeater. The functionality of the radio is constrained to those features included in its original design. Its circuitry cannot change "on the fly" to provide new modes or different frequency coverage. You need to buy or build an entirely new radio.

How Does Digital Radio Resolve These Problems?

Digital radio performs all the common radio system operations such as mixing and demodulating mathematically. No discrete components are involved, so there is no inaccuracy in the way that a mixer or a filter or a modulator performs. Due to work in the 18th and 19th centuries by mathematicians and physicists such as Fourier, Faraday, Maxwell and Heaviside, the equations of radio are well understood. These equations define radio and operations such as modulation and filtering both precisely and perfectly.

With signals in the digital form, a demodulator, mixer or even a complex system like a cellular telephone base station can be implemented as a set of equations that operate on the data stream and produce the desired output. These equations are implemented in software in a computer tasked to perform the radio system operations. This is where the idea of a "software defined radio" (SDR) came from.

As long as the equations correctly reflect the desired functions, the output data stream reflects the target system function perfectly (or as accurately as the radio's math functions can generate it – typically within a few parts per million).

What's the advantage of this approach?

The SDR's equations remain accurate over time and represent the desired radio system function perfectly. There are no analog components or "best fit" values that will introduce inaccuracy or change their values over time or with ambient temperature. All the radio operations are performed mathematically: "2 x 3" always equals 6.

Additionally, as the entire radio system (except for the ADC and DAC converters) is defined in software, its functionality can be changed at will simply by updating the radio system's programming: an FM transceiver can become a radar transmitter, an HDTV receiver, or a 1.5 GHz Inmarsat base station. The only physical limitations on the radio system are any constraints based on the ADC and DAC converters.

Thus, digital radio fully resolves the two analog system challenges described above.

Sampling: The Heart of DSP

The samples of the analog signal taken by the analog to digital converter (ADC) define the accuracy of the digital signal. If the analog signal is not sampled quickly enough, then the stream of numeric values coming out of the ADC will not properly track the target analog signal.

What is sampling? Let's use reception of an analog RF signal for a short example. A sample is defined as the numerical value (the magnitude) of the RF signal at a particular point in time. See Figure 1. Time is on the X axis:

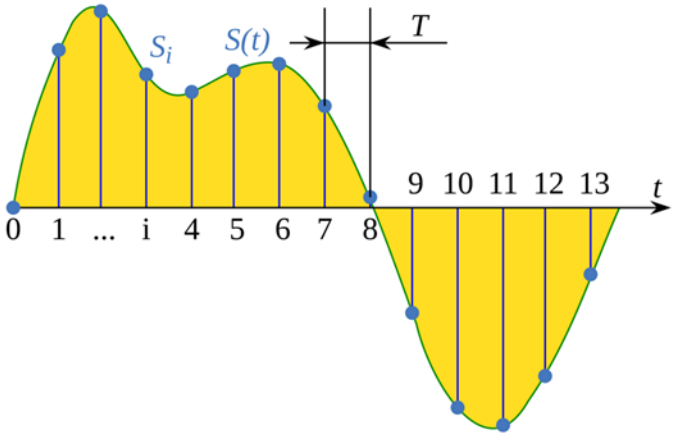


Figure 1 – Sampling of an Input Signal [5]

Samples of the RF signal are taken by the ADC at regular intervals. This is normally specified by the user and is called the sampling rate. The sampling rate is generally specified in samples per second (or Hertz). These numbers measure the magnitude of the RF signal and are typically represented by either integer (e.g. 3141) or floating-point values (e.g. 2.71828). Taken together, the stream of numbers can then be used to represent the input signal numerically. In Figure 1, the blue dots at regular intervals would represent the numerical magnitude of the signal at each point in time. Note that the samples will be both positive (above the X axis) and negative (below the X axis).

Samples must be taken quickly enough to ensure that they can accurately "track" the shape of the input RF signal. Sampling too slowly will not work because it may not "catch" important variations of the input RF waveform. Sampling too fast places constraints on the ADC and the computer, because the system must process the numeric stream of integers or floating-point numbers in real time.

There's a mathematical theorem devised by two Bell Labs scientists named Harry Nyquist and Claude Shannon in the late 1940s that specifies how fast an analog signal needs to be sampled for the digital samples to be

able to properly represent the analog signal[6]. This is called the Nyquist-Shannon rate, or just the Nyquist rate.

Nyquist-Shannon's theorem says that for the numerical sampling of the signal to be able to accurately represent (and reconstruct) the input signal, that the sampling must take place at twice the value of the highest frequency component (called the "information rate") in the input signal. See[4] for some background information on sampling and minimum sampling rates.

Having to sample a signal at twice its "information rate" is a big constraint, and in fact is the reason that SDRs and digital radio remained extremely expensive and impossible for the average user of the radio spectrum (for example, for amateur radio operators) for many decades. Only governments could afford computers powerful enough to be able to sample RF signals and process the sample stream at the high rates required for digital signal processing (DSP) to work. A bit more on this later.

Now to a short bit of analysis and a trick that modern SDRs use to make high sampling rates easier to process.

The Nyquist-Shannon theorem states that to accurately sample an HF signal at 14 MHz the ADC would have to operate at double that rate, or 28 MHz: 28,000,000 samples per second. This would be a very high sample rate.

If each sample (either integer or floating-point) is stored in 4 bytes, then the SDR would need to be able to process 28 million x 4 bytes, or 112,000,000 bytes per second. Now scale this up to higher frequencies. Imagine trying to use an SDR that works like this on 2m or 70cm: the sample rates (for example, 432 MHz x 2, or 964 million samples per second) would be prohibitive, at least for implementation on a personal computer!

Because of this problem, modern SDRs use a creative method to keep sampling rates manageable even at very high target frequencies. All SDRs, even the cheapest ones, include a pre-tuning capability using a local oscillator (LO) that greatly reduces sample rates even for UHF and microwave RF frequencies.

Here's how it works.

The SDR's hardware accepts a target frequency (say 432 MHz in the 70cm band) to be monitored, but then uses an internal hardware-based local oscillator (LO) to mix the target frequency down to a lower frequency. SDR terminology refers to this down-shifted frequency as "baseband". The sample rate is set based on the amount of bandwidth that the user wants to observe at the target frequency.

This mixing has the effect of "extracting" a sub-band of RF spectrum centred on the higher target frequency. The baseband can then be sampled at a much lower rate, well within the capabilities of the ADC, that is manageable for your computer to process.

Using an LO and baseband processing, sampling a one-MHz wide bandwidth of signals at 432 MHZ (i.e. the range from 432 to 433 MHz) can then be done with a sampling rate of only 2 MHz. This satisfies the Nyquist-Shannon theorem, because a Nyquist rate of 2 million samples per second will accurately capture a 1 M<Hz signal.

Without mixing, as we noted above, the sampling rate at 432 MHz would have to be 964 million samples per second!

Here's another example: you want to extract 146 – 148 MHz on the 2m band for further processing with Gnuradio or another software package. You set your SDR's RX frequency to 146 MHz and specify a 2 MHz target bandwidth[3]. The SDR sets the hardware's LO to 146 MHz and then samples the internal mixer's output at 4 million samples per second. Samples start coming out of your SDR at 4 million samples per second. The samples meet the Nyquist-Shannon requirement and will accurately represent two MHz of RF spectrum from 146 to 148

MHz. You can then process this sample stream on your personal computer to accomplish your objective.

Once you have a stream of samples coming out of your SDR then you can use several software packages to demodulate or otherwise process them, or you can even write your own DSP code.

Why Does Sampling Work?

Sampling works because the number of samples is sufficient to accurately represent the underlying RF spectrum. Sampling at twice the highest frequency ensures this (the Nyquist-Shannon theorem). You can certainly sample at more than twice the highest frequency if you'd like, but you don't gain anything.

Sampling at BELOW the Nyquist rate causes a serious problem called aliasing. Aliasing guarantees that the sample stream will be corrupted and will not accurately represent the RF spectrum properly. New users of Gnuradio, LiquidSDR and other digital signal processing packages often experience unusual situations where the data stream representing a desired signal is corrupted. This is usually due to aliasing.

How Samples are Represented in Digital Radio

Samples can be represented in two ways. The first way is by an integer or a floating-point number that represents the magnitude (relative "loudness") of the signal. This is intuitive and is the best way to think about sampling for the user new to DSP. A signal (such as an audio signal from a microphone, or RF from antenna) is represented by a stream of integers or floating-point values. In the literature, this is called "real sampling".

The second way of representing a signal is less intuitive. This method also encodes the magnitude of the signal at each sample point, but it does this by recording two floating-point values for each sample. Each sample from the ADC generates two values, which are called the "in phase" (or "I") value and the "quadrature phase" (or "Q") value. This method of recording samples is called "IQ" or "analytical" sampling.

This sounds complicated, but this approach has some significant advantages over real sampling when it comes to analyzing and processing the target signal. Let's talk a bit more about IQ sampling and then look at why it can be better than real sampling.

The Mysterious "IQ"

Articles about DSP and SDRs are full of references to "IQ". What's this all about?

Recall from above that IQ sampling is also called "analytical sampling" in DSP literature. It is a more precise way of encoding (or decoding) signals because the sampling process records the phase (timing) of the sample in relation to all the other samples in the waveform. The magnitude as well as the phase of each sample can be inferred from the two I and Q values.

Having phase information available in addition to sample magnitude allows DSP code to analyze the signal more deeply, with resultant improvement in signal processing operations[2]. This can be of great advantage when working with complex signals.

IQ sampling measures the values coming out of the radio's ADC. Rather than simply measuring the magnitude of the signal, analytical sampling measures an incoming signal (for example, an SSB signal on 14.250 MHz) by comparing the

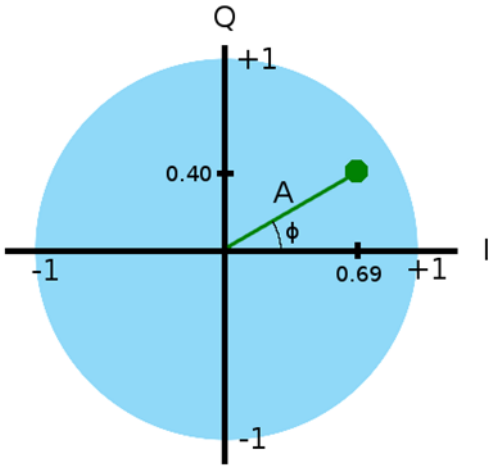


Figure 2 – Phasor Diagram (from [7])

ADC output at each instant in time with two sinusoidal (sine-like) waves that are generated internally. These internal sine waves are in "quadrature": the two waves are 90 degrees "out of phase". See Figure 2. Not how the black sine wave trails the pink wave by ¼ cycle.

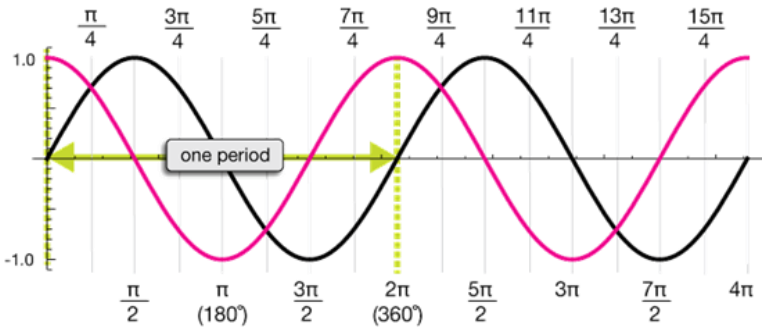


Figure 2 – Two Sine Waves 90 Degrees Out of Phase [15]

Each ADC sample is compared to these two sinusoidal signals to generate one IQ sample. The "I" value at the instant of sampling is the phase value of the leading sine wave at that instant; the "Q" value is the phase of the trailing sine wave. See Figure 3.

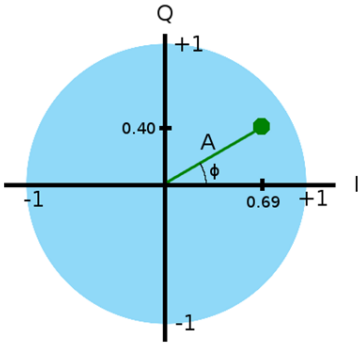


Figure 3 – Phasor Diagram (from [7])

The green dot in the diagram represents one digitized sample from the radio's ADC. Figure 3 is called a "phasor" diagram because sample points on the diagram correspond to the values of pairs of I and Q samples, which are visible on the X and Y axes of the diagram. The I value ("In-phase") of this sample is 0.69, and the Q value ("Quadrature -phase", or 90-degree offset) is 0.40.

Phasor diagrams may alternatively be called "constellation graphs" by DSP software packages such as Gnuradio[8]. See Figure 4 for a sample RF constellation graph from gnuradio. This figure depicts a noisy "QPSK" digital signal at 1296 MHz: hence the IQ values' rectangular shape. Note the labels on the X- and Y-axes (In-phase and Quadrature: I and Q).

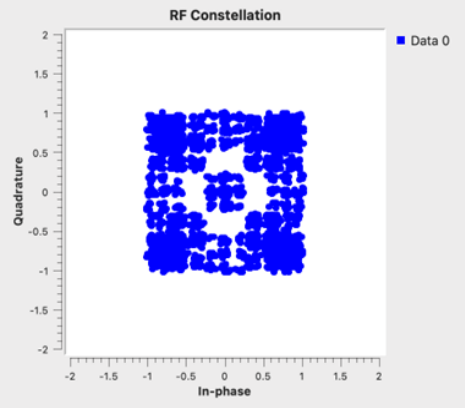


Figure 4 – Gnuradio Constellation Graph

Now try to visualize the phasor diagram of Figure 3 in real time: As a signal is received and samples are generated, the green dot in the diagram will "bounce around" with the varying amplitude and phase (or frequency) of each incoming sample. The dot will move at a rate matching the sampling rate. If you are sampling RF at 1 million samples per second (i.e. the ADC is digitizing RF from the antenna at this rate), then the green dot will "bounce around" at that rate as well. This means that I and Q (which set the dot's position) will also change 1 million times per second.

Representing signals by a stream of I and Q values has many advantages. If you are generating signals (such as an RF signal for transmission), varying the magnitude of the I

and Q values in the stream can generate ANY form of modulation: AM, FM, SSB, BPSK or other digital modulation schemes – anything you can think of!

If you are receiving a signal (maybe an RF signal in one of the ham bands), then whatever that signal is, it can be represented by a stream of I and Q values. Whether the signal is SSB, AM, FM, or any other form of modulation, it can always be represented by I and Q.

Both simple and even the most complex forms of modulation can be generated or detected simply by measuring the magnitude (or generating the correct magnitudes) of I and Q values. Watch the video referenced in[2].

On the phasor diagram I, Q and the length of the sample's hypotenuse (the green line in Figure 3) always form a right triangle. Thus, the magnitude of any sample can be computed from I and Q using the Pythagorean theorem. The sample magnitude A (length of the green line in Figure 2) is equal to

$$A = \sqrt{(I^2 + Q^2)}$$

In Figure 3, the sample magnitude A (the length of the green line) is therefore $\sqrt{(0.69^2 + 0.40^2)}$, or 0.7975587.

Visualization

A) What would amplitude modulation look like on a phasor diagram?

The distance of the green dot from the centre of the diagram in Figure 3 represents the amplitude of the signal at any point in time. If you were looking at an AM signal, the angle of the dot (its phase (called ¤ or "phi" in Figure 3) would not change, but the dot would move "in and out" in the diagram as the amplitude of the received signal changes (this is amplitude modulation, after all!). See Figure 4.

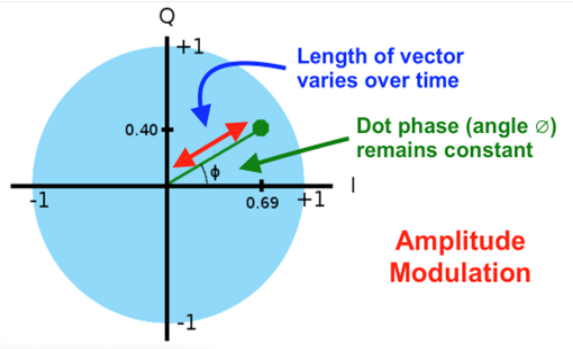


Figure 4 – Amplitude Modulation on a Phasor Diagram

B) How about frequency modulation?

In an FM signal, the amplitude of a signal does not change, but the frequency of the signal varies according to the modulation level. Frequency changes are related to phase changes, so the green dot in Figure 4 would remain at the same distance from the diagram's origin, but its phase (angular direction, called ¤ in Figure 5) from the origin would change. In real time, the dot would look like it is "vibrating" back and forth from its stable centre position. This vibration would be in accordance with the way that the FM signal is being modulated. As with the AM example above, there would be 1 million I and Q pairs generated per second. See Figure 5 for a graphical interpretation of how FM would look.

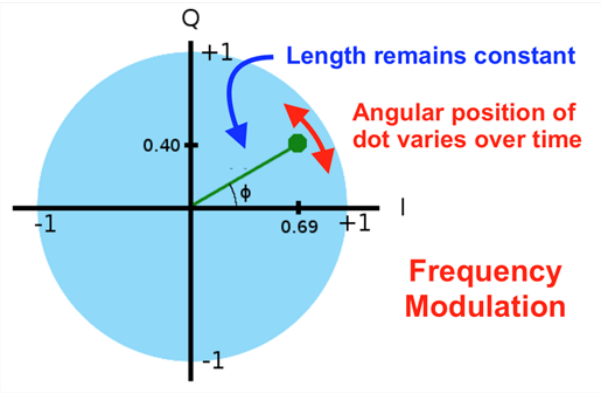


Figure 5 – Frequency Modulation on a Phasor Diagram

Some Questions

There are some obvious questions here:

A) If real sampling would simply generate 0.7975587 as the ADC value, why bother recording two samples I and Q when it seems that one will do?

Real sampling records the magnitude of each sample but contains no information about what part of the signal is being sampled. The phase value Ø (which is recorded implicitly by analytical sampling) shows exactly where "in the cycle" each sample is taken. This can have computational advantages later.

B) Real sampling will generate signal magnitude directly. Computing square roots is CPU intensive, wouldn't it make DSP faster to not have to do this calculation?

Yes, computing signal magnitude by calculating $\sqrt{(I^2 + Q^2)}$ does take some CPU cycles, but CPUs are fast these days and the benefits outweigh the computational overhead.

C) Why bother with this complexity? It doesn't seem to have any advantage.

Using analytical sampling has other incredible advantages such as being able to modulate, demodulate, filter, and mix signals together with simple mathematical operations. For example, you can mix two analytical signals (those represented by I and Q sampling) by just multiplying their IQ samples together.

What Aren't We Discussing?

- We've glossed over some neat details here because they would overcomplicate an introductory article. However, if you're keen and would like some further detail, here's a peek behind the curtain:
- Each I and Q sample is represented digitally by what is called a "complex number". There is a whole field of mathematics that deals with complex numbers, and this math (which is not that different from normal math) can be used to performs basic operations on IQ samples. All modern programming languages support complex mathematics.
- The two sinusoidal waves that are used to calculate I and Q for each sample are a cosine wave (used for I) and a sine wave (used for Q). The I wave is pink in Figure 2, while the Q wave is black. Sine and cosine waves are, by definition, 90 degrees out of phase – in quadrature – and this meets the foundational requirement for analytical sampling.
- I and Q are related to each other and Ø by trigonometric identities. For example, for any sample Ø = arctan *(Q/I)*. These rules simplify many signal processing calculations.
- Use of IQ satisfies the Nyquist-Shannon theorem and allows a signal with a maximum component of *n* Hz to be sampled at *n* times per second. This doesn't violate the theorem (recall that it says that you need to sample at twice the information rate) because n analytical samples contain 2 *x n* values: remember, one IQ sample has two floating-point values I and Q in it.

Typical Software Defined Radios (SDRs)

SDRs which incorporate both ADC and DAC converters and output a stream of complex IQ samples are readily available at low cost. These SDRs typically use a USB connection to output the I and Q data stream.

Probably the most popular low-cost SDR is an "RTL dongle". See Figure 6 for three typical devices. These radios are cheap (well under US$50[9]) and can receive signals typically in the range between 70 MHz and 3 to 4 GHz. These radios receive but do not have transmission capability.

Figure 6 – Some Typical "RTL" Receivers

The user sets the radio's RX frequency and its sample rate using an application program on their computer. The sample rate also defines the

bandwidth of the receiver. The entire RX bandwidth is converted by the dongle to a complex IQ data stream that is delivered to the attached computer via USB. Applications running on the computer such as Gnuradio or gqrx receive the IQ data, display the received RF spectrum, perform demodulation, and play the received signal through the computer's speaker. Very cool!

RTL dongles are a great way to get started with software-defined radio. Their wide frequency coverage makes them very flexible – you can demodulate and listen to all sorts of signals in the VHF and UHF bands. See https://rtl-sdr.com for an interesting site that focuses on creative projects using RTL dongles.

If you want to transmit as well as receive, then you can buy an SDR transceiver (Figure 7). Transceivers are more expensive (on the order of US$100 to $1000 for a lab-quality unit), but they allow you to experiment with generating signals as well as receiving them. Examples would include the Pluto, the HackRF, the BladeRF and a line of transceivers from Ettus. See[10] for pointers to their web sites. I've written SSB, FM and digital mode transmitters and transceivers using gnuradio and LiquidDSP with these units.

These radios offer higher quality ADC and DAC converters, broader frequency coverage, and higher sampling rates. They typically also connect to your computer via USB.

Power output from these SDR transceivers is only on the order of 20 milliwatts (about 13 dBm) so if you want to do any practical amateur radio with your SDR transmitter you will need a driver amplifier and likely a small power amplifier (PA) as well. The driver will boost 20 mW to a watt or two, and the PA can get you beyond QRP level if you need it.

I'm working on a driver amplifier for 23cm EME over the holiday season. I have an SDR-based 23cm EME transmitter working here in the shack, but I need to boost its 20 mW output to about 1.5 watts so I can drive my big 350 watt 23cm PA. I've never designed a driver amplifier before, so it is my winter project. Whether I am successful or not, I will describe how it goes in a future column.

Figure 7 – Two SDR Transceivers

The Role of Your Computer in All This

That's enough technical discussion. Let's talk about how your home computer supports your SDR and how it performs DSP operations in real time.

RTL dongles receive a slice of RF at a specified frequency, convert the entire bandwidth to a complex IQ data stream, and send it to your computer via a USB port. Your computer needs software to interpret this stream of floating-point numbers and make sense out of it by using DSP code to interpret the data stream.

Typically, this program code (which you can write yourself, if you want to learn!) filters the received bandwidth to locate a signal of interest and then applies demodulation code to recover the desired signal from the RF data stream. This is all done using

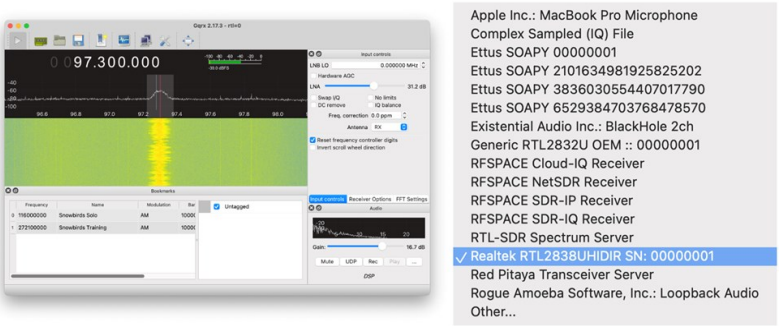


Figure 8 – gqrx: User Interface and Some of the Devices Supported

mathematics as described above. The demodulated signal can then be sent to the computer's speaker: you have a working radio!

Complete software defined radio packages such as gqrx[11] (see Figure 8) will work with more than a dozen SDR devices and can be of great utility in your ham shack. gqrx is free, and runs on Windows, MacOS and Linux. Buy a $25 RTL dongle and give it a try.

With gnuradio, you have a graphical user interface and all the tools to build your own radios, but you need to select and connect the SDR building blocks yourself. Fortunately, gnuradio has good introductory tutorials showing how to do this. See https://wiki.gnuradio.org/index.php/Tutorials.

As an aside, the gqrx package is built on top of a gnuradio foundation.

If you decide to make the leap to writing your own software, do not think that you need to understand every low-level aspect of the mathematics: DSP packages such as Gnuradio or LiquidDSP[12] provide functions that perform modulation, demodulation and filtering, for example. Your code needs to set up data structures and load them with the IQ data, but to a large extent the "nitty gritty" can be left to the DSP package's functions. Don't be afraid to give it a try.

Is Digital Really Better than Analog?

I want to revisit this topic quickly before ending the column for this issue. Digital radio is clearly superior to analog because of the fact that, once digitized, RF signals can be processed much more accurately mathematically than by sending the raw analog signals through various analog filters, mixers and demodulators. Modern electronics and computing technology make DSP a reality.

Analog radios can only approximate the mathematics of radio, while a digital approach can perform all radio operations much more precisely. Digital signal processing is not subject to vagaries of analog components, which can change value with age, temperature, and operating conditions.

Additionally, software-based radios can change their functionality very easily via a software update. A software-based FM receiver can become an SSB transceiver, or a radar transmitter, or a GPS receiver simply by reloading the radio's software. Analog radio functionality is fixed because the discrete circuitry in the radio is hard-wired and can perform only one function.

These changes represent a technological revolution[13]. Digital radio really is better than analog, and it is here to stay.

What Brought This Revolution About?

This is a great question. The mathematics underlying radio have been well understood for at least one hundred years, but techniques like digital signal processing (DSP) were not practical until (at the earliest) the late 1980s when computing power had grown enough to be able to perform digital signal processing in real time.

Initially, DSP was only available to governments, as corporate and personal computers had far too little computing power and storage capacity to be able to perform these complex calculations. Governments had access to advanced microelectronics and supercomputers: hence large military services, for example, were the first to be able to take advantage of real time DSP techniques. The increased capabilities of digital radio gave military services both a strategic and tactical advantage.

Real time DSP and the existence of software-defined radio used to be a "classified" technology, and publication of papers on software-based radios was restricted in the USA and other nations due to national security concerns[14] .

With the incredible advancements in microelectronic and computing power (CPU

speed, instruction pipelining, memory capacity) between the 1990s and the beginning of the 21st century, personal computers were finally able to perform real time DSP calculations, and software defined radios proliferated.

This paradigm shift (see Thomas Kuhn's book in[13]) challenged many engineers and radio corporations when a brand-new technology upended decades of standard practise and commonly held beliefs about radio systems. This commotion continues to some extent today. Amateur radio operators, governments and radio training programs face these challenges as well.

With the development of cheap SDR radios like the RTL-SDR, software-based radio systems reached a tipping point and broad adoption of the technology and development of applications like gnuradio, gqrx and WSJT brought DSP and SDRs to the mainstream user.

All major manufacturers of commercial and amateur radios have moved their product lines to the digital realm, and other than ADCs and DACs, virtually no new research and development is being done in the area of analog radio systems.

Conclusion

That's it for this issue.

I hope that you found this article of interest. If you are new to digital radio and decide to purchase an RTL dongle and give gnuradio or gqrx a try in your own shack, then I'd be interested to hear how it went.

Have fun, don't limit yourself, and always keep learning!

Feedback can be directed to the Editor, or directly to me at mcquiggi@sfu.ca. Thanks for reading!

73,

~ Kevin VE7ZD / KN7Q

References:

[1] The fundamental concepts of analog radio apply equally well to radio in the digital realm. It is just the implementation of these ideas that differs. An analog and digital filter, mixer or amplifier perform exactly the same functions: but in the digital realm these operations are performed mathematically. Think of your analog radio system training: there are equations for finding resonance of antennas and filters, or for winding coils. Digital radio uses similar equations – but not to physically wind coils or build filter networks! These networks are modelled mathematically. The function that the components (either analog or digital) perform is identical. Digital radio is just a different way of representing the standard blocks that make up a radio.

[2] There's an excellent 19-minute video called "Basics of IQ Signals and IQ modulation & demodulation" by Alan Wolke, W2AEW online at https://www.youtube.com/watch?v=h_7d-m1ehoY&t=180s. Well worth watching!

[3] 2 MHz bandwidth implies a sampling rate of 4 million samples per second (Nyquist-Shannon theorem).

[4] See https://www.allaboutcircuits.com/technical-articles/nyquist-shannon-theorem-understanding-sampled-systems/ for a pretty good introductory article about sampling and the Nyquist-Shannon theorem. If you would like to read a more in-depth article, then quite a technical article is on Wikipedia at https://en.wikipedia.org/wiki/Nyquist%E2%80%93Shannon_sampling_theorem.

[5] Graphic from Wikipedia; see https://en.wikipedia.org/wiki/Sampling_(signal_processing).

[6] In 1948 Shannon defined what Scientific American later called "the Magna Carta of the Information Age". See https://en.wikipedia.org/wiki/A_Mathematical_Theory_of_Communication. Shannon relied on earlier work by his colleague Harry Nyquist in 1924 on maximum signalling rates that can be supported on telegraph/telephone lines.

[7] A good explanatory article on IQ sampling is on the web at http://whiteboard.ping.se/SDR/IQ.

[8] The open source Gnuradio DSP radio package is available at https://gnuradio.org. Gnuradio includes a "constellation sink" as part of its GUI tools. This graphical widget displays the phasor diagram of its input IQ data stream.

[9] See https://www.nooelec.com/store/sdr/sdr-receivers/nesdr.html for a good quality RTL dongle. eBay and Amazon offer many other cheaper models as well.

[10] Pluto: https://www.analog.com/en/design-center/evaluation-hardware-and-software/evaluation-boards-kits/adalm-pluto.html#eb-overview; HackRF: https://greatscottgadgets.com/hackrf/one/; BladeRF: https://www.nuand.com/bladerf-1/. All these units work well, have significant online development communities, and work with popular DSP software packages. Laboratory-grade SDRs are also available from https://ettus.com, but they are considerably more expensive than the other transceivers.

[11] gqrx is a free full-functioned SDR receiver that supports AM, FM, SSB and other modes on PCs and Macs. You can download it at https://gqrx.dk/. Author Akexandru Csete is OZ9AEC.

[12] LiquidDSP is an alternative DSP package to gnuradio. It lacks a graphical user interface but is callable from Python, C++, C and other common programming languages. I use LiquidDSP in my own digital EME transceiver software.

[13] There are always detractors when innovative new technology reaches an inflection point and is on the brink of rendering older technologies obsolete. Readers may be interested in Thomas Kuhn's excellent book "The Structure of Scientific Revolutions" (ISBN 978-0226458120, US$9.99 at Amazon) where the author reviews technological change over the past few hundred years and highlights the illogical arguments often made by those experts affected by the introduction of superior new technologies.

[14] See https://en.wikipedia.org/wiki/Software-defined_radio.

[15] Image from https://i.pinimg.com/originals/2c/1e/ab/2c1eabb48202b3f994bb65d5b35785fe.png

A look at WSPR

Weak Signal Propagation Reporter

In recent issues of the Communicator, readers have been introduced to Surrey Amateur Radio Communications' latest project, a WSPR Beacon. WSPR (pronounced "whisper") stands for Weak Signal Propagation Reporter. It is a protocol, implemented in a computer program, used for weak-signal radio communication between amateur radio operators.

What is WSPR?

WSPR is a protocol designed by Joe Taylor, K1JT, for probing potential propagation paths with low-power transmissions. The software code, now open source and developed by a small team, is designed for sending and receiving low-power transmissions to test propagation paths on the MF and HF bands.

Transmissions carry a station's callsign, Maidenhead grid locator, and transmitter power in dBm. The program can decode signals with a signal-to-noise ratio as low as −28 dB in a 2500 Hz bandwidth. Stations with internet access can automatically upload their reception reports to a central database called WSPRnet, which includes a mapping facility. An accurate clock is essential both for transmission and decoding of received signals.

The WSPR Protocol

The type of radio emission is "F1D", frequency-shift keying. A message contains a station's callsign, Maidenhead grid locator, and transmitter power in dBm. The WSPR protocol compresses the information in the message into 50 bits (binary digits). These are encoded using a convolutional code with constraint length K = 32 and a rate of r = 1/2. The long constraint length makes undetected decoding errors less probable, at the cost that the highly efficient Viterbi algorithm must be replaced by a simple sequential algorithm for the decoding process.

Protocol Specification

The standard message is <callsign> + <4 character locator> + <dBm transmit power>; for example "VE7SAR CN89 37" is a signal from station VE7SAR in Maidenhead grid cell "CN89", sending 37 dBm, or about 5.0 W (legal limit for 630 m). Messages with a compound callsign and/or 6 digit locator use a two-transmission sequence. The first transmission carries compound callsign and power level, or standard callsign, 4 digit locator, and power level; the second transmission carries a hashed callsign, 6 digit locator, and power level. Add-on prefixes can be up to three alphanumeric characters; add-on suffixes can be a single letter or one or two digits.

- Occupied bandwidth is about 6 Hz
- Synchronization is via a 162 bit pseudo-random sync vector.
- Each channel symbol conveys one sync bit (LSB) and one
- Duration of transmission is 162 × 8192/12000 = 110.6 seconds.
- Transmissions nominally start one second into an even UTC minute: e.g., at hh:00:01, hh:02:01, etc.
- Minimum S/N for reception is around –34 dB on the WSJT scale (2500 Hz reference bandwidth).
-

Applications

The protocol was designed to test propagation paths on the LF, MF and HF bands. Also used experimentally at VHF and higher frequencies.

Other applications include antenna testing, frequency stability and frequency accuracy checking.

Usually a WSPR station contains a computer and a transceiver, but it is also possible to build very simple beacon transmitters with little effort.

For example a simple WSPR beacon can be built using the Si 570, or Si 5351. The Raspberry Pi can also be used as WSPR beacon.

WSPR is a fascinating addition to the world of amateur radio, offering new avenues for exploration and experimentation. Its ability to test propagation paths with low-power transmissions makes it a valuable tool for any amateur radio operator. If you can see propagation to a desired DX location is favourable with less than 5 Watts, you can probably work it at 100 Watts.

Established WSPR Frequencies

Band	Dial freq (MHz)	Tx freq (MHz)
160m	1.836600	1.838000 – 1.838200
80m	3.592600	3.594000 – 3.594200
60m	5.287200	5.288600 – 5.288800
40m	7.038600	7.040000 – 7.040200
30m	10.138700	10.140100 – 10.140300
20m	14.095600	14.097000 – 14.097200
17m	18.104600	18.106000 – 18.106200
15m	21.094600	21.096000 – 21.096200
12m	24.924600	24.926000 – 24.926200
10m	28.124600	28.126000 – 28.126200
6m	50.293000	50.294400 – 50.294600
2m	144.488500	144.489900 – 144.490100

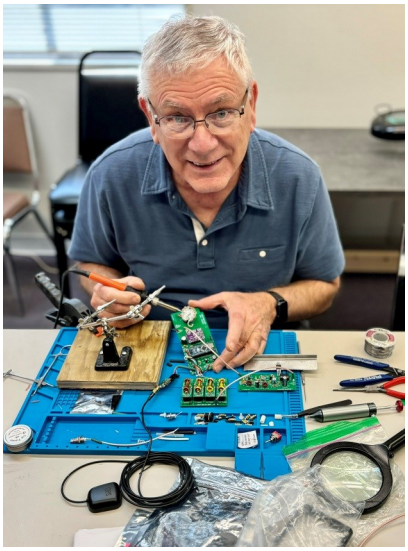
See also "The 'What's It?' of WSPR" in the September-October 2023 issue of the SARC Communicator Journal, pages 15-24. On the next few pages you will find an update on this SARC project.

SARC's project

An update on unlocking the world with WSPR: The 5W Beacon Project

A collaboration between French and Canadian Amateur Radio enthusiasts and SARC

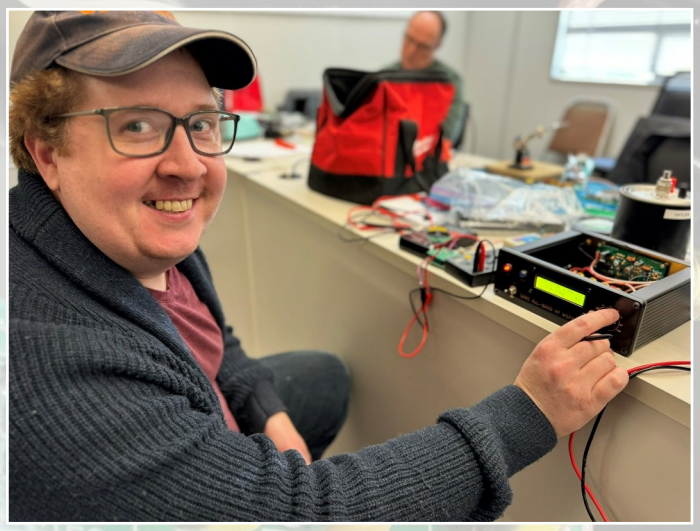
By: JOHN SCHOUTEN VE7TI



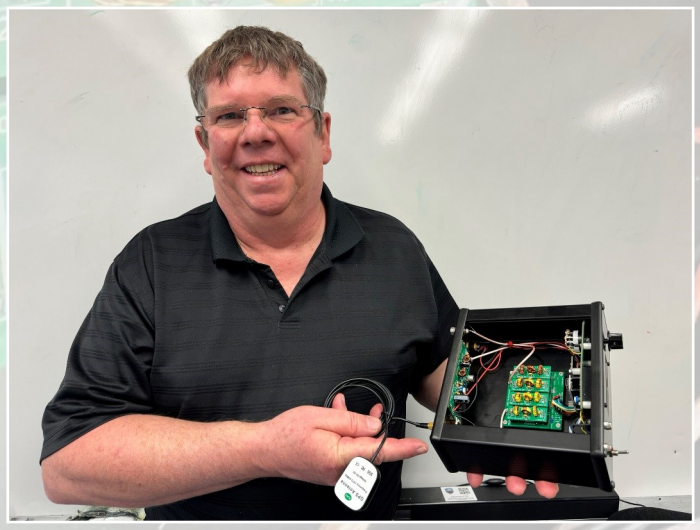
The test builds of Pierre F6IDT and Dino VE7NX's WSPR beacon described in the last issue few of The Communicator are nearing completion.. Ten kits are currently being assembled by SARC members with the required Advanced certification. Under the expert tutelage of Dino VE7NX, we have stepped through the seven printed circuit boards, winding coils, measuring components and fine-tuning our soldering skills.

It has been reasonably trouble-free, other than having to verify the Chinese made components to ensure that their values are within marked tolerances. It is variation in these components that can make a significant difference, as we found out when biasing the driver transistor. A difference of as little as one volt significantly raised its operating temperature, always a risk with solid-state electronics.

On the next page a few our Saturday solderers at work at various stages of their beacon transmitter. We should be on the air by the time this Communicator is published.



ALGN



The $50 Ham

WSPR-ing around the world

by DAN MALONEY N7DPM

Everybody has a bucket list, things to be accomplished before the day we eventually wake up on the wrong side of the grass. Many bucket-list items are far more aspirational than realistic; very few of us with "A trip to space" on our lists are going to live to see that fulfilled. And even the more realistic goals, like the trip to Antarctica that's been on my list for ages, become less and less likely as your life circumstances change — my wife hates the cold.

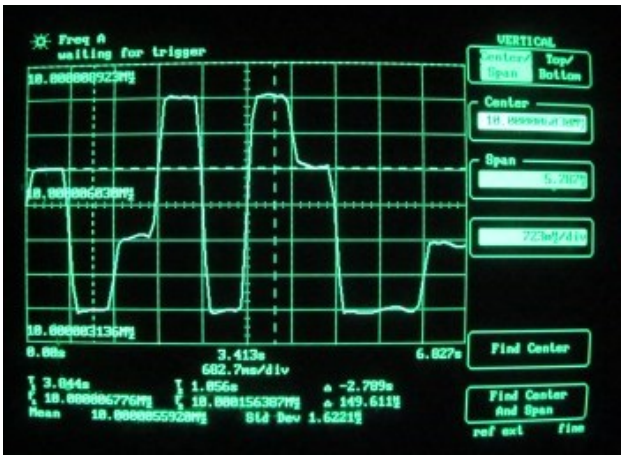
Luckily, instead of going to Antarctica by myself — and really, what fun would that be? — I've recently been getting some of the satisfaction of world travel through amateur radio. The last installment of "The $50 Ham" highlighted weak-signal digital modes using WSJT-X; in that article, I mentioned a little about the Weak Signal Propagation Reporter, or WSPR. It's that mode that let me test what's possible with very low-power transmissions, and allowed me to virtually visit six continents including Antarctica and Sweden-by-way-of-Alaska.

Whispers in the noise

Ask a random amateur radio operator what's on his or her mind at any given moment and chances are pretty good the answer will be, "How are the bands right now?" That's shorthand for what the current state of the ionosphere is, which largely determines how well RF signals will bounce off the various layers of charged particles that wrap around the planet. These layers shift and move in diurnal cycles, and undergo longer-term cycles of strengthening and weakening that depend on the cycles of magnetic activity on the Sun.

Assessing the state of the ionosphere and finding out which bands have a path to which points on the globe used to be something that hams had to do by spinning the dial and listening for beacon stations. Beacons are stations that transmit a generally low-power signal from a fixed, know location on a regular schedule. If you can hear the beacon, chances are good that you've got a propagation path between you and the general area of the beacon on that frequency.

While beacons are useful, they have their limits. They depend on the kindness of strangers, who devote resources to running and maintaining the beacon station. Beacons are also subject to occasional maintenance outages, so not hearing a beacon you expect does not necessarily mean that you don't have a path between two points. But perhaps the most limiting aspect of traditional beacons is that they operate on a pull model — you have to sit down at your radio and intentionally tune into the beacon's frequency and decode what you hear — beacons almost always use continuous wave (CW) mode with Morse code. Add to that the fact that whatever you learn about the propagation paths available to you stays pretty much within your shack, and beacons have limited utility.

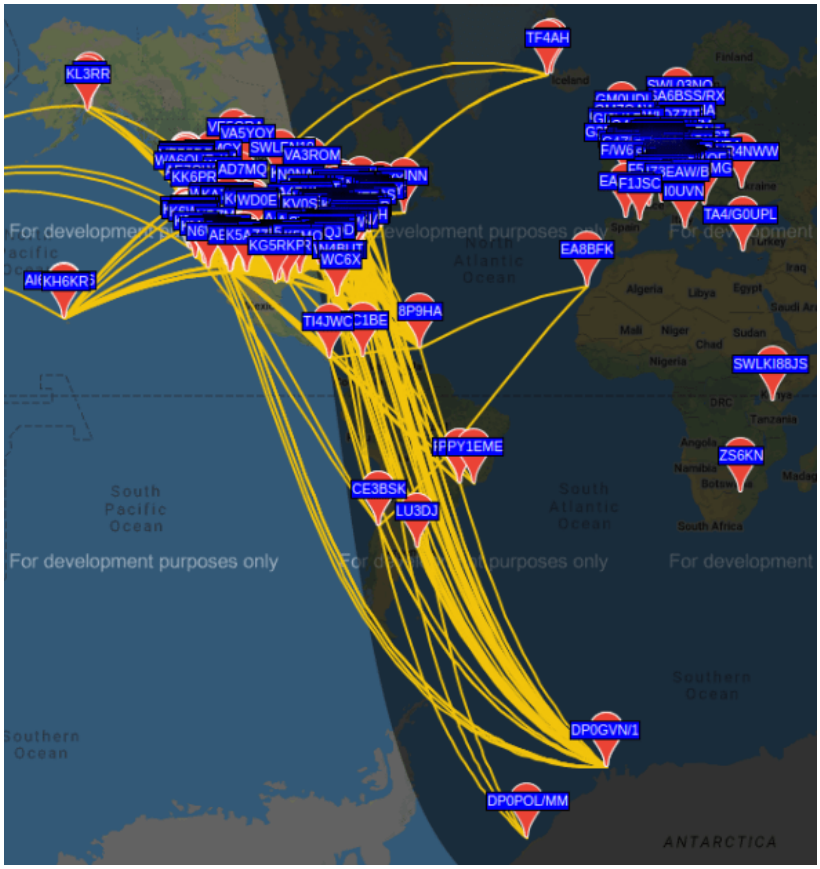


WSPR signal by Louis Taber, CC BY-SA 4.0

With those limitations in mind, Joe Taylor (K1JT) began working on a digital mode in 2008 specifically for exploring propagation paths. The protocol was dubbed WSPR, which of course everyone pronounces as "whisper," which given its capabilities is an apt name indeed. WSPR is a digital mode that employs special digital signal processing algorithms to decode signals with a signal-to-noise ratio (SNR) of -28 dBm in a bandwidth of 2,500 Hz.

When transmitting, WSPR sends a compressed 50-bit message that encodes the station's callsign, the grid location, and the transmitter power. The message is modulated using frequency-shift keying at a very low bit rate — less than 1.5 baud. This means an entire message with error correction takes almost two full minutes to send. Transmissions are synchronized by the WSPR software to begin one second into each even-numbered minute, making accurate time synchronization essential.

Propagation made visual



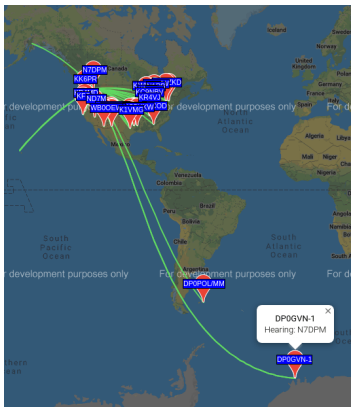
The shape of things to come — east coast stations are hitting Antarctica on 20 meters, which means I might too in a few hours when the Sun sets over my QTH.

As cool as the WSPR protocol is, the magic of WSPR comes from the "R" part of its name: reporting. This is where WSPR closes the loop that traditional beacons leave open, since WSPR client software can be configured to log any WSPR signals received and decoded by a station to a central database. WSPRnet.org is the place where all the reports go; the site contains a searchable database of all "spots" reported as well as a map that shows current contacts by many, many stations.

The map on WSPRnet is admittedly a bit janky — it's based on Google Maps, and an error dialog pops up every time you load a new view. There are other visualizations, though, but even with the issues, WSPRnet's map is a great way to see what propagation paths may be available to you at the current time.

For example, I took a quick peek at the 20-m band just now and found that from my area, I've got solid paths to pretty much all of North America. More importantly, I can see that I have no paths into Europe or Asia, and very little to the south into Central and South America. But, by looking at what's going on with paths on the east coast of the US, where the sun is currently setting and which are actively reaching several stations in and just offshore of Antarctica, I might have a path to the bottom of the planet coming up as the sun sets over me.

Doing my part



As I mentioned in my first weak-signals article, I've currently got WSJT-X running on a Raspberry Pi 4 that I have dedicated to ham radio use. WSJT-X has a built-in WSPR mode, which makes it easy to switch back and forth between exploring possible propagation paths with WSPR and exploiting that information to make actual QSOs using FT8 or one of the other supported modes.

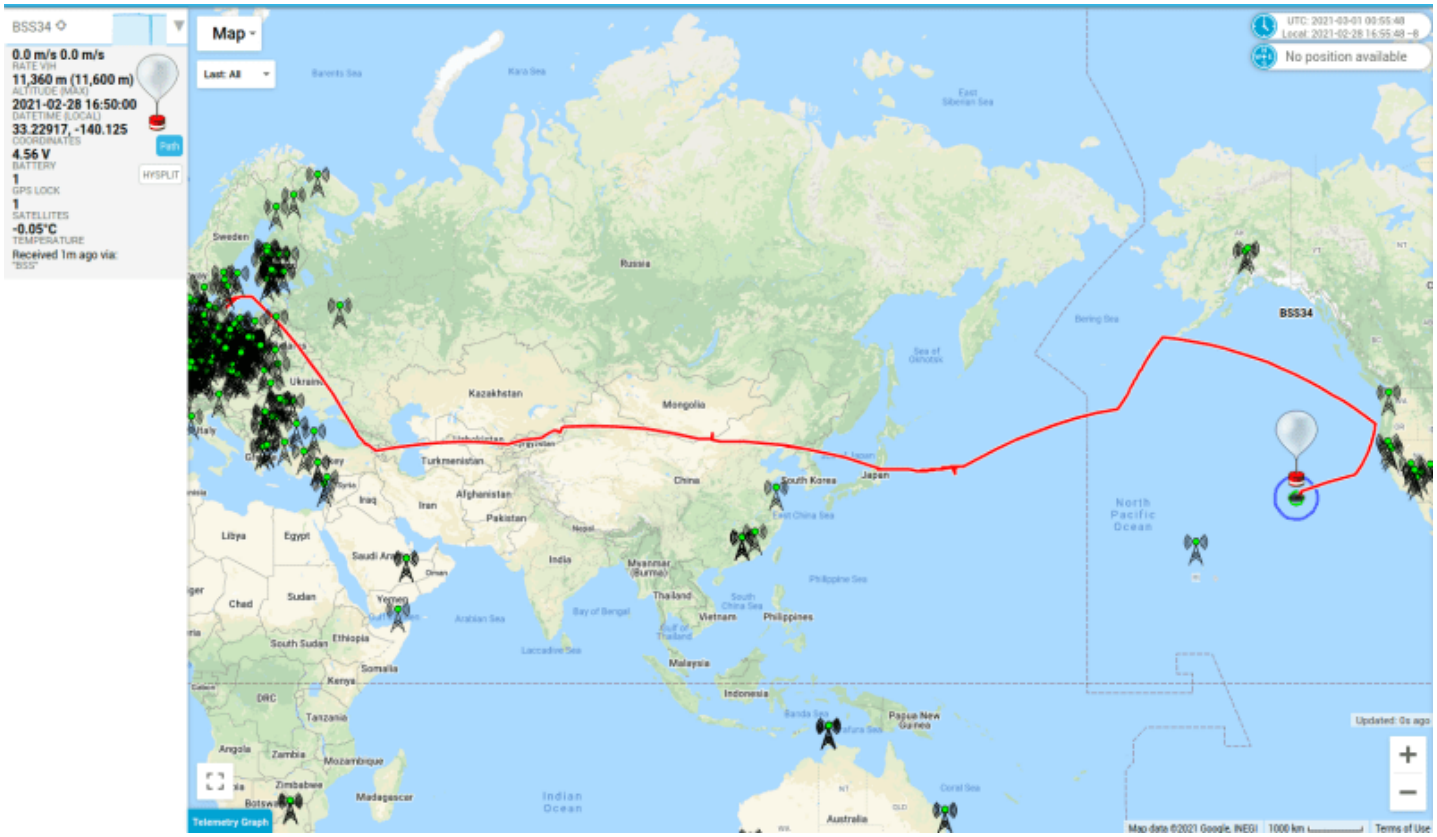
The beauty of using WSJT-X for WSPR work is that it's basically completely automated. Depending on how you set it up, you can either be a dedicated WSPR receiving and reporting station, or you can choose to also transmit.

When I'm going to be in the shack / office, which is almost always, I set up WSJT-X to transmit on WSPR with a 20% duty cycle — that is, one out of every five two-minute blocks will be dedicated to transmitting. That way, I can do my part contributing to the WSPR map — there generally aren't many WSPR beacons operating in my part of North Idaho, so I figure this is my way of pitching in. Plus, I get the occasional bonus of nabbing a cool contact, like the aforementioned hit on DP0GVN-1, a German research vessel parked off the coast of Antarctica that I reached on the 30-m band using just five watts.

Sweden, by way of Alaska

As cool as it is to know you've made a solid contact over a path of about 10,000 km on less power than it takes to run an LED light bulb, there's also a lot to be said for the unusual stations you receive when you leave your WSPR station running. Case in point: the other day I glanced up at WSJT-X and noticed a strange callsign, SA6BSS. After a while of looking at callsigns you get to know which general areas they come from, and I suspected this was a "rare DX" coming from Europe, which is really hard for me to hit with my antenna from the inland Pacific Northwest. A quick lookup on QRZ.com confirmed that SA6BSS is a ham named Mikael Dagman, based in southern Sweden — cool!

I quickly spun up the WSPRnet map and was surprised to see that Mikael's station was reporting its position as coming from Alaska rather than Sweden. I zoomed in the map a little and found that the signal was coming from a grid hundreds of kilometers south of Unalaska Island in the Aleutians. What in the world would a Swedish ham be doing in the North Pacific in February?



I shot Mikael a quick email about the contact, and he confirmed that I had indeed received a correct position report from his WSPR station, currently floating around the world on a party balloon! Since he released the balloon on Feb 23, it has traveled at around 11,000 meters altitude from Sweden to the Middle East, across Asia, and over the Pacific to just off the coast of Oregon. There it took a hook and headed back out to sea; as I write this it's heading roughly in the direction of Hawaii.

Mikael was kind enough to include a little information on the WSPR transmitter he included on his balloon, which is completely solar-powered and weighs in at only 2.6 grams. The spareness of his design is almost comical — it's just a GPS module, an ATMega328, and an Si5351 for the transmitter. It's a perfect example of what can be done on a budget, which is right in line with "The $50 Ham" concept. So naturally, building a lightweight, inexpensive WSPR beacon will be the basis of the next installment in this series.

~ *Hackaday*
Dan Maloney N7DPM

For the original article visit: The $50 Ham: WSPR-ing Around The World | Hackaday

Literally WSPR-ing around the world — at least halfway so far. SA6BSS launched a balloon carrying a WSPR transmitter on Feb 23 that crossed the Pacific; I copied it when it was south of the Aleutians.

A small-packing antenna

for 2-metre portable work

by JENNY LIST

Jenny List is a regular contributor to **HACKADAY**. You can see this article and many others there: [A Small-Packing Antenna Hackaday]

One of amateur radio's many interests comes in portable operation, taking your radio to an out of the way place, usually a summit, and working the world using only what can be carried in. Often this means using the HF or shortwave bands, but the higher frequencies get a look-in as well. A smaller antenna is no less the challenge when it comes to designing one that can be carried though, and [Thomas Witherspoon] demonstrates this with a foldable loop antenna for the 2 metre band.

The antenna provides a reminder that the higher bands are nothing to be scared of in construction terms, it uses a BNC-to-4 mm socket adapter as its feedpoint, and makes the rectangular shape of the loop with pieces of fiberglass tube. The wire itself is flexible antenna wire, though we're guessing almost any conductor could be used. The result is a basic but useful antenna that certainly packs down to a very small size, and we can see it would be a useful addition to any portable operator's arsenal.

If you're a 2 metre band user, this certainly isn't the first time we've visited lightweight antennas for this band.

~ Jenny List

The basic soldering workshops

Igniting the spark of electronics circuit building

By JOHN SCHOUTEN VE7TI

In the rapidly evolving world of Amateur Radio electronics, understanding the fundamentals of electronics is more crucial than ever. Whether you're a ham who likes to experiment with circuitry, a DIY enthusiast, a student exploring STEM fields, or simply a beginner eager to delve into the world of circuits, mastering the art of soldering is a valuable skill.

It all began in mid-2023 when a graduate of our SARC Canadian Basic Amateur Radio course inquired about learning how to solder a set of Powerpoles for a new transceiver. He mentioned that he had never soldered before but considered it a skill he should acquire for his new hobby. Recognizing an opportunity, Larry Bloom VE7LXB, who has been actively involved in developing our post-course "Get on the Air" program, proposed that this could be a useful workshop offering for our new hams. As one of our primary instructors and course coordinator, I volunteered to explore the possibility.

I contemplated the potential projects or circuits that could be included to make the workshop more interesting. Drawing from my experience with our antenna workshop, I knew that including a project they could build in class enhances satisfaction, understanding, and sense of mastery. About two years ago, my young granddaughters, aged five and seven at the time, assembled a 3D LED Christmas tree project under my supervision. I was amazed at their precision, patience, and skill. I documented this experience in The Communicator January-February 2022, and they still talk about it. Given that there was time before Christmas, I decided that this would be a suitable project.

When I did the project with my grandkids, I purchased the 3D LED kits from Amazon, each costing less than C$10. Our classroom can comfortably accommodate twelve students, so I ordered fifteen kits to have a prebuilt sample and some spare parts in case replacements were needed. Ultimately, I ordered them from

AliExpress in China, which was considerably cheaper than Canadian suppliers, despite the additional delivery time and the risk that they might not arrive before we needed them. Fortunately, they did arrive within two weeks of placing the order.

Filling the twelve seats was not an issue; in fact, the response exceeded our expectations. The workshop comprised two components: the first 45 minutes included a presentation on basic equipment, solder, and good soldering practices. This was followed by a hands-on session building the kits. All students received a handout by email describing the workshop, optional tools they might invest in, and a step-by-step assembly guide. For those who did not wish to buy their own tools, we had several club soldering stations and hand tools available.

As anticipated, some students, especially those who were older, with poor eyesight or shaky hands, required assistance, particularly with bridged solder joints at closely spaced transistor leads. However, resistors, capacitors, and the 37 LEDs proved to be less challenging. The boards were of good quality and handled the heat well. After the planned three hours, most students had successfully finished their kits, with some completing them at home and a couple returning the following Saturday to finish their trees. Feedback was very positive, and there were inquiries from others about when the next workshop would be held.

By November, free Saturdays before Christmas became scarce. In consultation with our club directors, it was decided that we would attempt one more workshop provided we could get additional kits in time. I couldn't order the same kits at the same price, but the online store I had ordered from had a sale on a similar-looking kit. Expecting at least two more workshops, I ordered 30 units with free shipping and the understanding that they would be delivered before the end of November. They did indeed arrive as promised, but this time, we were assessed duty and taxes by our customs branch, increasing the cost of the kits. Nonetheless, we were still able to offer the workshop for C$10. Upon inspection, I found that these kits

were similar with two significant differences: the circuit board layout and the quality of the boards themselves. This meant that I had to redo the assembly notes and build another sample kit.

Separately, I ordered an additional two kits for myself, anticipating that my granddaughters would once again want to take a soldering pencil in hand to build them. In the intervening two years, these kits now had twice the LEDs and boasted twelve colors, whereas their originals only had red, green, and blue. I was correct; they eagerly took on the opportunity to build them again, with success and no burnt fingers or other significant issues.

The only pre-Christmas day still available on our calendar was December 16th, and we booked our classroom for another twelve participants. I presented the 45-minute introduction, followed by the assembly workshop. Several LED trees were completed within the allotted three hours. There was one circuit board issue where the trace lifted from the board due to excessive heat, and we had one kit with mislabeled resistors. The other issues were similar to the workshop before, missed solder pads and a few bridged connections.

We have enough supplies for one more class; however, that may not take place until closer to Christmas 2024. In the meantime, we have been asked about additional projects. I am now researching other readily available kits, including electronic dice, clocks, and basic AM-FM receivers. Several teens joined the latest workshop, so we also see this as an opportunity for empowering the next generation of makers. Soldering skills are desirable in our hobby, and we have found that the opportunity interests even non-hams.

~ John VE7TI

IC-7300 et al user group

An external keypad for phone, CW & RTTY

by TOM WA2IVD & HAM RADIO A2Z

This new column will look at hints and accessories for the Icom IC-7300, IC-7610, IC-9700 and similar transceivers.

Building an external keypad for transmit memories

Tom's excellent YouTube channel ***Ham Radio A2Z*** includes some excellent links. In this video we're going to build an external keypad to access the transmit memories on the 7300, 7610 and 9700. This will work for the voice, CW or RTTY transmit memories, and believe me, in a contest it will save your voice.

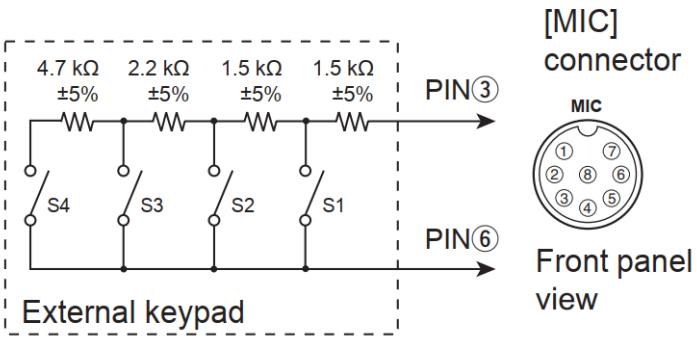
Below are the parts that Tom ordered to build the box, but you may be able to source them locally:

- Pushbutton Switches: https://amzn.to/39XMqYV
- Microphone plugs & jacks: https://amzn.to/39SrG4Q
- Project Box: https://amzn.to/3wFOmPy
- Resistor assortment: https://amzn.to/3fV1SZx

The video: https://www.youtube.com/watch?v=I3b1aNdg3pQ&t=86s

Because so many of our local members own one of these excellent Icom products we will offer some applicable hint or project in upcoming Communicator issues.

~



◇ External keypad

A circuit is used to output memory content from 4 memories. You can output desired memory content such as that from a CW Memory keyer (M1 ~ M4), Voice memory (T1 ~ T4), RTTY Memory (RT1 ~ RT4) to be transmitted.

- Push a switch to send the memory information.
- Hold down the switch for 1 second to repeatedly send the memory information.

ⓘTo use the external keypad, turn ON the following items in the CONNECTORS set screen. (p. 8-5)

MENU » SET > Connectors > **External Keypad**

- VOICE: ON
- KEYER: ON
- RTTY: ON

ⓘThe External keypad is not supplied by Icom. (User supplied)

This external memory keyer is described in the Icom manuals. You simply record your CQ, callsign, etc. into one of the available memories using your mic, and then press the appropriate keypad button to transmit it..

Ancient Amateur Archives

The history of repeaters

by BILL CONTINELLI W2XOY

Bill Continelli W2XOY is a regular contributor to This Week in Amateur Radio (TWIAR) North America's premiere Amateur Radio news magazine. TWIAR is produced weekly and may be heard via podcast or the web at https://twiar.net/

We trace the development of FM and repeaters up to 1970. Since the FCC rules at that time had no provision for repeater operation. Stations and repeater service were operated under the part 97 provisions covering remote control. In February 1970 the FCC came out with docket number 18803, which set forth the Commission's proposed repeater rules. These included small sub-bands set aside for repeater operation, a ban on linked cross-band and multi-band repeaters, a requirement for whistle-on or other tone control, and a requirement that the licensee of a repeater station be in attendance at the transmitter or at an authorized fixed control point to monitor all transmissions of the station.

In regards to the 2m band, the FCC set up the repeater sub-band in such a way that two-thirds of it would not be accessible to technicians. Reaction was quick and negative. The ARRL and others felt that the proposed rules were so restrictive that they might be the end of amateur repeater operation as it existed at the time. Counter proposals far less restricted than the FCC's, were submitted to the Commission. While amateurs waited for the revised FCC rules, another problem had to be solved. When 2m FM operation started in the 1960s, 146.94 had been chosen as the national simplex frequency. This was the highest wide band FM frequency available to Technicians. After repeaters came along, amateurs discovered that the

Yaesu FT-2FB 12Ch,10W 2 Meter VHF Ham Radio Transceiver

surplus commercial equipment in use at that time had a maximum bandwidth of 600 kHz. Thus, 146.34 was chosen for the first repeater input. However, in areas where 146.94 was already in heavy use by simplex stations, 146.76 was then chosen as the output. This led to the problem of non standard splits and in some areas of the country, repeaters such as 34.76, 28.94 and 34.82 could be found. The frequency 146.94 was a battleground between the simplex versus repeater groups. Amateurs were also fighting a minor battle over 146.64 MHz which in some parts of the country was a DX simplex frequency.

To make matters worse, all transceivers back then were crystal controlled with crystals at $10 per pair, it cost $120.00 or about $450 in today's dollars to fill all twelve channels in a 2-meter radio. It was possible to equip your radio with the repeaters and simplex frequencies used in one area and then find all of your channels were useless 200 miles away.

A national plan was needed. The Texas VHF FM Society proposed such a plan which was described in the May 1972 issue of QST. In it, the repeater offset was standardized at 600 kHz. 146.94 and 146.64 became repeater outputs. 146.40 through 146.58 became simplex and 146.52 was chosen as the national simplex frequency. In the 146 through 147 megahertz range, accessible to Technicians and above, there were fourteen repeater and seven simplex channels.

The 147 through 148 range, available only to Generals and above, had fourteen repeater and six simplex channels. Note that in the Texas plan, all repeater inputs were 600 kHz below the output, even in the 147 through 148 megahertz range. Except for changing the inputs to the high side, above 147 megahertz, the Texas plan was adopted.

The gradual acceptance of a 2m band plan still did not resolve the FCC issue. The Texas plan, as good as it was, violated the FCC's 1970 proposal. The Commission still had not issued any repeater rules, nor had they acted on the ARRL's 1969 request to give Technicians the full 2M band. Finally, in September 1972, the FCC issued new rules covering repeaters, logging, portable and mobile operations. Liberal repeater sub-bands were authorized at 52 through 54, 146 through 148, 222 through 225 and 442 through 450 megahertz. Logging requirements, especially for repeater and mobile stations was simplified. Repeater operators no longer needed a tape recorder hooked up to their stations. The requirement for a portable or mobile station to notify the FCC of operation in a particular radio district was also reduced. No longer would amateurs contemplating a cross country trip with their radios have to write to each district on their journey in order to inform the FCC engineer in charge about the trip.

Repeaters would have to be licensed. Callsigns beginning with the prefix WR would be issued. The repeater license application was complex. Each applicant for a repeater license had to submit certain data to the FCC regarding the technical, operational, and effective radiated power of the proposed station, whistle-on or tone control was no longer required. Two repeaters could be linked, but multi-linked or cross-band repeaters were prohibited. Repeater monitoring and control requirements were made more flexible, and finally, the FCC acted in part on the ARRL's 1969 proposal.

Although they did not give Technicians full 2m privileges, they did grant them access to the 147 through 148 megahertz segment. Technicians could now operate all 2m repeaters without violating FCC rules.

The new FCC repeater rules, coupled with the Texas plan caused a surge in 2m FM activity. It also was the shot in the arm the hobby needed to fully recover from the decreasing growth caused by incentive licensing. Manufacturers such as Drake, Standard, Regency, Tempo, Janave, Prague, and Midland poured rigs onto the amateur market. Heathkit had the very successful HW 202, followed by the even more popular HW 2036. The increase in the number of Technicians on 2M FM finally killed the "Technicians are experimenters, not communicators" theory.

And finally, thanks to 2m FM, amateur radio grew by over 33% in the 1970s. In 1975, due to increased demand, the FCC authorized the use of 144.5 to 145.5 megahertz for repeater operation.

Technicians were given access to this sub-band. In 1978, the FCC relaxed the rules, eliminated the separate repeater license and the WR prefix, and gave technicians the full 2m band. From 1978 through 1981, the synthesized revolution took place as affordable PLL and microprocessor rigs drove the last of the crystal controlled radios off the market.

Today, a name brand 2-meter H.T. costs about $135.00. With it, you can access over 4,000 repeaters, or scan the VHF high band. Compare that to 1972, when a crystal controlled radio equipped with twelve channels cost $300, or about $900 today.

We have truly come a long way.

~

SARC Trello site

What is Trello? According to their website, Trello is the visual tool that empowers a team to manage any type of project, workflow, or task tracking.

We recently launched a Trello site managed by Reg VA7ZEB to receive ideas and to permit our members to see some of the issues and ideas that we are discussing.

You can visit the site at: ve7sar.net/brainstorm

I decided to risk my $284

I swore to God I wouldn't buy another cheap Chinese radio. I hope he'll forgive me. I just pulled the trigger on a Vero VR-N7500. I thought I'd share some initial thoughts.

I bought this radio for its remote-rig capability. My goal is to once again spend winters in South America (I did for years and then Covid messed up my lifestyle), but this time I want to be able to stay in touch with the local radio community in Vancouver while I'm down there.

I considered the Icom 9700 (call it $3000 CAD by the time you've paid for the radio and the remote software) but that's a Windows-only solution and its peer-to-peer architecture requires opening up ports on your router, which is no great challenge on home Internet but is often impossible on cellular systems (which are constantly changing IPs and often block most ports for incoming traffic). I wanted an Android solution (so I didn't have to lug around my laptop) and I wanted it to work through firewalls and on cellular. This Vero/VGC ticked all my boxes so I decided to risk my $284 Canadian dollars on it.

The Android app is complicated, but honestly what I'm doing is complicated and I don't see how they can make it easy. There was nothing I couldn't solve quickly with a bit of Youtubing (like double click the power button to put the radio in pairing mode which is just weird). Be aware that if you are technically challenged or you give up easily, this radio and its software are not for you.

The remote rig system works perfectly. It doesn't sound great but I don't care. It works reliably for a tenth of what the Icom solution costs, and from any Android cell phone, not just laptops. Be aware, there's about a one second lag in transmission and reception using the app, which is par for the course for this sort of application. To my surprise and delight, the Android app lets you choose where the remote-rig servers are, and I minimized lag by using the US servers instead of the Chinese ones. I haven't tested it from the Caribbean Sea yet, but it works from home and I fully intend to be checking in to Vancouver-area repeaters from Cartagena next winter.

The radio itself is a high-quality piece, with mostly metal construction and a nicely built speaker microphone that has logical and useful controls. Using the radio as a standalone base station, I get excellent signal reports and my own reception of known signals has also been excellent. It's a bit odd to have a speaker mic on what I'm using as a base station but it works well.

I'm told this thing will iGate and Digipeat out of the box, too. I'll investigate that in the coming months, but I'll note now that if it really does all that decently, this may be the most feature-rich VHF radio I know of.

So far, I couldn't be happier. I just hope Vero/VGC can stay in business. This thing has been out for years and I haven't seen another radio from them. Fingers crossed.

~ Reg VA7ZEB

Daniel Romila VE7LCG

Daniel's Workbench

Why you need an external walkie-talkie microphone

Sound advice on inexpensive accessory mics

by DANIEL ROMILA VE7LCG

Daniel Romila VE7LCG found that even a $5 mic can produce good results with a bit of modification.

One of the right answers is that you will look cool. Seriously, for less than $5 CAD (= 3.64 USD = 3.34 EURO = 66.83 ZAR), shipping and taxes included in November 2023, you will look cool.

For those of you that want not only to look cool, but also to play with the electronic connections for the microphone, speaker and programming, here is the schematic for the ports on the side of a walkie-talkie, from https://www.miklor.com/COM/UV_Technical.php

Many people who downsized and also many people who've just started the amateur radio hobby use a simple walkie-talkie as a base station. Some walkie-talkies

3.5mm Plug

Sleeve	Mic –	PTT	Rx Data	(to the radio)
Ring	Mic +			
Tip	+V	(from the radio)		

2.5mm Plug

Sleeve	Speaker –	PTT	Data GND
Ring	TX Data	(from the radio)	
Tip	Speaker +		

Connect Sleeve to Sleeve for PTT

have noise if used in the charging cradle when transmitting, but it is not very significant, and some do not have any noise. I completely eliminated any power supplying noise for my cheap walkie-talkie by adding a 3300 uF capacitor at the 12 V power plug inside the cradle, so nothing is seen outside. Having an external microphone/ speaker allows an easier connection of an external speaker or headphones, because of the standard dedicated audio jack those external microphones have:

What you see in the above left picture is a fake connector. I opened the case, and there isn't a complete connector there, so it is not possible to connect headphones in the one that you see in the picture above left. Shown on the right is what you will find inside a less than $5 CAD external speaker microphone. I took the pictures after opening the case.

The most annoying thing is not the fake connector for the head-phones, but the very small hole for the microphone, hole that is not even centered. The microphone itself is a big capsule and of a good quality.

I tried it as supplied and the voice was weak. I verified that by listening to myself on a repeater connected to Echolink. Enlarging the hole was not enough, so I unsoldered the microphone capsule from the PCB, attached two wires, that I braided, and made the hole in the plastic case big enough to be able to mount the microphone directly on the case. I glued the capsule inside the case for stability.

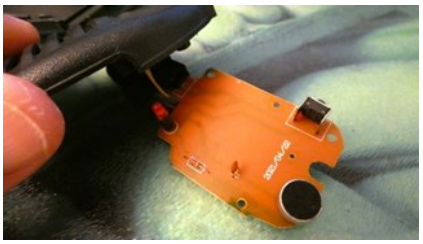
I am very happy with the result. Other radio amateurs helped me with practical radio tests, in which I compared the original microphone from the walkie-talkie with this new external one. It all worked very well.

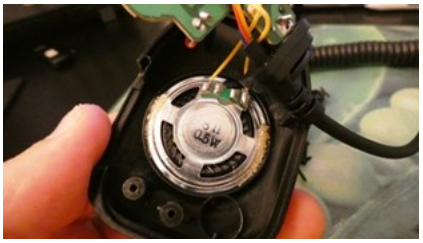
Now you should really think whether you need an external speaker/microphone, and the hassle of modifying it (LOL).

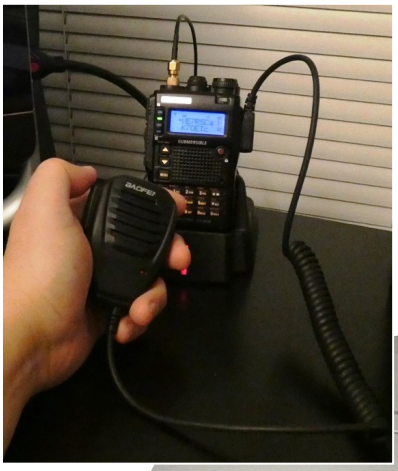
If you are lucky and have a proper audio connector, you can count on it being mono audio. If a stereo headphone is connected there, only the LEFT side of the headphones would have sound. It is bearable, but it can be resolved with a dedicated MONO headphone, originally MONO or a STEREO adapted to be MONO.

Anyhow, it is much preferable to connect a speaker/headphone here, instead of directly into the walkie-talkie, where the plug for audio is shared with data. See again the above schematic.

Another use of an external microphone, very important for me, is to separate my own body







from the walkie-talkie itself when looking for a sweet radio spot on my balcony for a future antenna installation. I keep the external microphone in my right hand, so I have the speaker from this external device close to me.

In the left hand I have the walkie-talkie and I "walk" it around the area where I intend to place an antenna. In my case, living in an apartment building, it is very important to find a radio sweet spot, and even 20 centimeters left-right from the optimum position can bring a "miss" of a wanted repeater.

If you want to see such an external speaker-microphone disassembled, there is a YouTube video which even shows how to replace the electret microphone capsule inside with a bigger one. To be honest, I did not hear any difference after the modification in that video, and never felt that the electret capsule that I bought is too small, taking into consideration the FM bandwidth allowed for radio amateurs is not music quality FM, but bare voice modulation:

https://www.youtube.com/watch?v=4rEYs8qXPDA

A shorter and simpler review of a Baofeng external microphone/speaker unit, with an LED on it, but without showing any disassembly:

https://www.youtube.com/watch?v=OeyQGXYUybk

I readily admit that what I bought is crap, but it does a very good job for me after modification. Still, I would not spend more than $5 CAD on an external microphone/speaker.

~ Daniel VE7LCG

Ham Radio Trivia:

Did you know that one of the world's largest electronic component distributors started out simply as a ham radio hobby business ? The company DigiKey started 50 years ago simply selling a kit of parts to build a digital electronic Morse code keyer for radio amateurs. Hence the name DigiKey. It was founded in 1972 by Ron Stordahl AE5E, in Thief River Falls, Minnesota. The company is still headquartered there. The company now has over 3 million sq.ft. of facilities, 5000 employees, 15 million products, $5 billion in annual sales, and DigiKey is ranked #121 on Forbes' 2023 list of America's largest private companies.

~ Courtesy TV Repeaters Repeater Newsletter

…more from

A USB GPS/Glonass sensor

with a GT7020-KT IC

by DANIEL ROMILA VE7LCG

Daniel Romila VE7LCG provides you with an evaluation of an inexpensive USB GPS

The only thing still making me use Android tablets is the GPS capability of those tablets, with built in GPS hardware and software/ maps. Otherwise, I prefer to use an Android emulator running Windows 11. I can go anywhere, on mountains or even in a crowded city, take out the Android device and find out where I am.

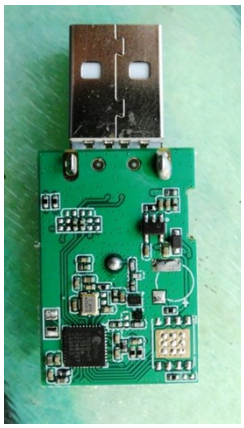
I wanted to solve everything about GPS with Windows tablets, which usually come without GPS built-in capability. At the end of 2023 I found a USB GPS/GLONASS adapter for $5.20 CAD (=3.78 USD =3.48 EURO = 69.38 ZAR), shipping and taxes included. The picture from the vendor's Chinese website do not show that it is in fact a U-blox 7.

On the right is the seller's picture. I took the next four pictures of the product I received in the mail box.

The fact it is a clone of a known product is good for me, because that means I can find information about software and projects by others.

I was very interested in opening the USB dongle because on YouTube at https://www.youtube.com/watch?v=T4YOvA9J92g I saw a different inside picture than what I have, with a soldered battery and different position for the components,

Mine has a circle with PLUS written next to it and with two big pads to solder something power related. After I looked in the datasheet of the main integrated circuit, I found that there should be a battery for backup – probably in a use with some data acquisition storage on the USB dongle itself.



The integrated circuit is Ublox G7020-KT. (G7020 has 3 versions which differ among them only by size and package).

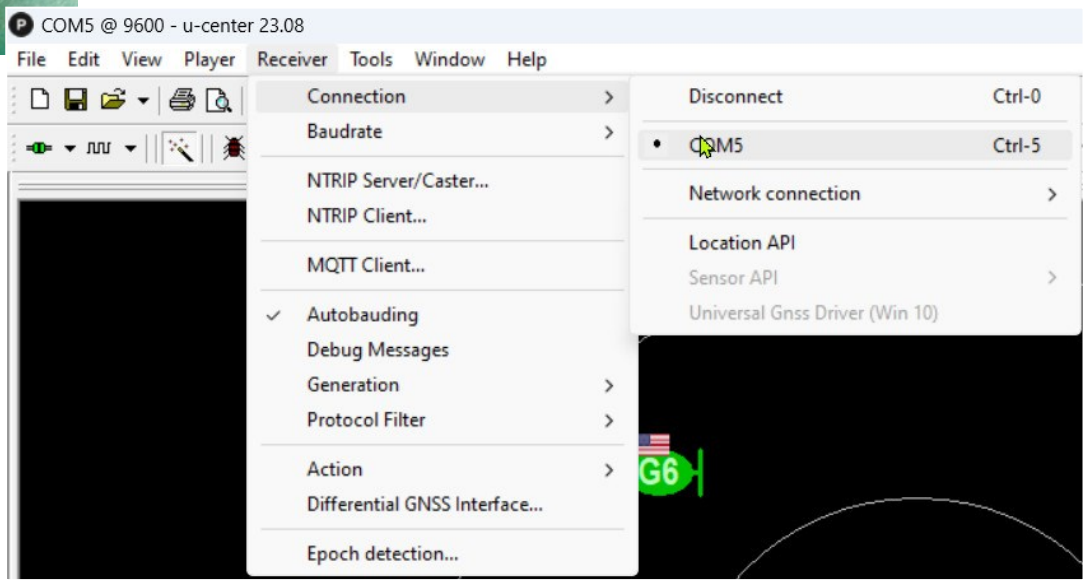
The main thing about this IC is that it can receive the 556-channel u-blox7 engine GPS & QZSS L1 C/A, GLONASS L1OF, SBAS: WAAS, EGNOS, MSAS Navigation. The update rate is up to 10 Hz. It has a slow cold start of up to 30 seconds, which made many buyers think it would never work, when actually they just had to wait longer. It is a sensitive chip, and the precision for position is up to 2.5 meters. A summary datasheet can be found at:

https://www.datasheets.com/en/part-details/ubx-g7020-kt-u-blox-49257368#datasheet

I copied a block diagram *[top next page]* from a 38 page more detailed datasheet.

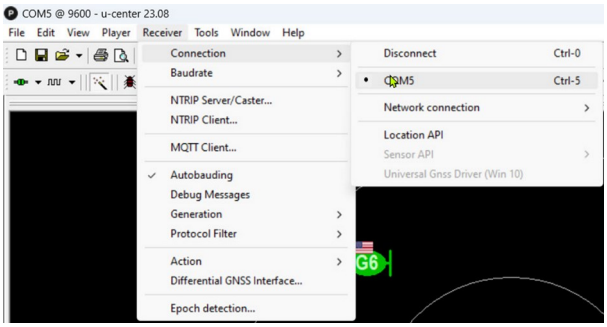
https://innovictor.com/pdf/UBX-G7020-Kx_DataSheet_%28GPS%20G7-HW-12001%29_Confidential.pdf

But the most useful thing when I receive something in the mail is

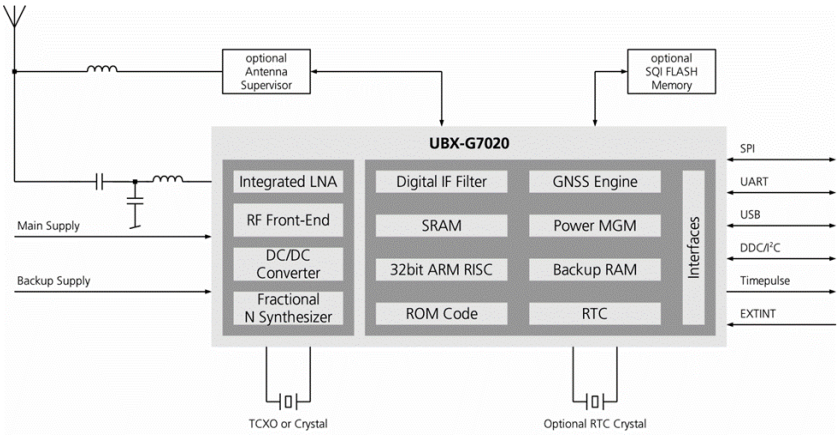


to try it and see if it works. I confess I bought it for the cheap price, without having a clear idea if I will ever have everything I need as software to make it useful. First, I took a USB extension cable that I know works well. *(I happened to buy 2 USB extenders, from the same place, one to be used with a good data rate, and the other one just to be capable of carrying power. I always try the cables with some ARDUINO boards I have, with some already designated GOOD USB cables and extenders as comparison samples.)*

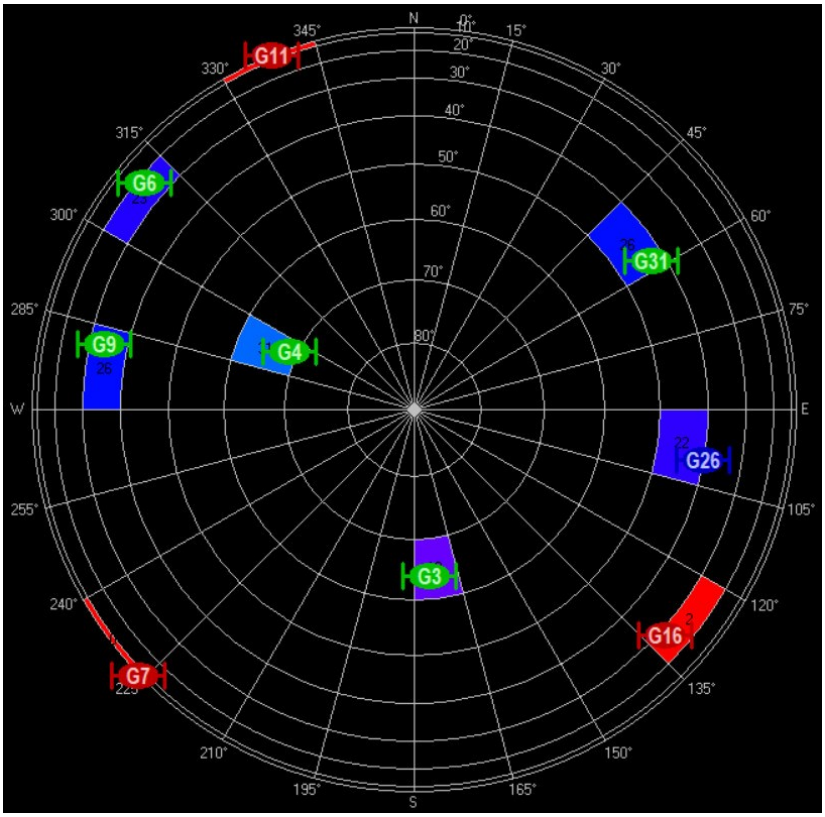
So, having a good, trusted USB extender, I connected the GPS/GLONASS USB dongle into a Windows desktop. It surprised me to see Windows 11 recognize the USB device, by verifying so in the Control Panel. Anyhow, there is free available test software and necessary drivers, at: https://www.u-blox.com/en/product/u-center. From there it is the old u-center version we want, not the new one, which is meant for different newer devices. No registration required. After the installation, the USB dongle must be connected to the program, by clicking:



One can be lucky and connect automatically the first time. For me, I had to tell the program the location of the dongle by clicking COM5 each time. Now you wait about 30 seconds. The LED on the dongle will alternate from GREEN to RED. That means it works and it has positioning satellites in range.

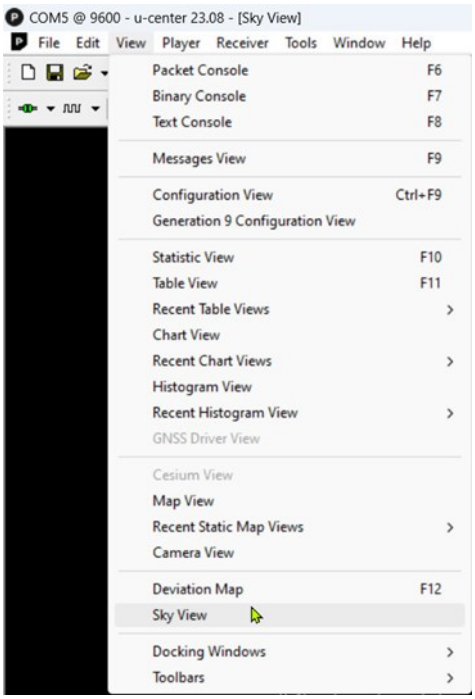


I live on the top level of a wood building. I have a metallic sheet roof at less than one meter from the dongle. Next to the dongle is my TELUS Internet wireless router but I still get 5 positioning satellites:



When it works, the u-center software shows all kinds of small panels on the right side, which update and change

colors. If you want to have a big information panel, like I have above, you must click SKY VIEW:

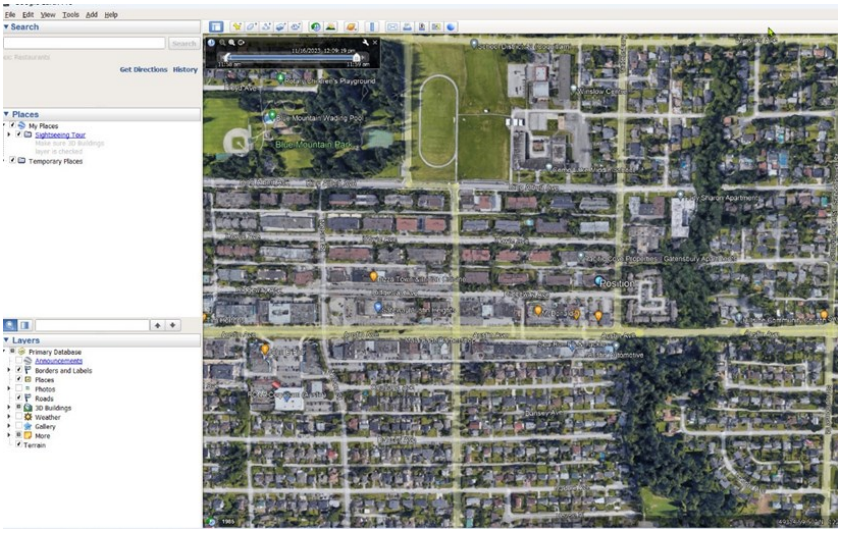


In a similar way one can choose to see his/her position on a skeleton world map, the altitude, messages and so on.

I had problems getting rid of some selected views. I could no longer see the X on the corner of windows, to close them. The Google Map did not work for me, and it said some server(s) were not connected, so I might have to read the user manual (LOL).

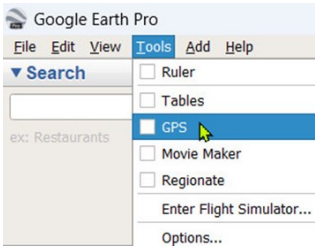
Anyhow, my intention was to use it with Google Earth Pro, so, after seeing that my USB dongle works, I abandoned the other wonderful details this GPS hardware can give me in the test software, and went into Google Eart Pro. It can be downloaded free from:

https://www.google.com/earth/about/versions/#earth-pro



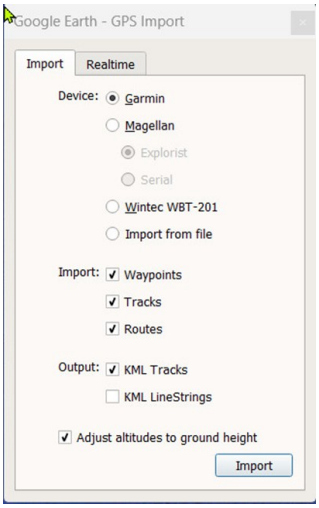
When the GPS dongle is started and works, the screen looks like the picture below left.

Somewhere in the middle there is a blue dot, and next to it is written “Position”.



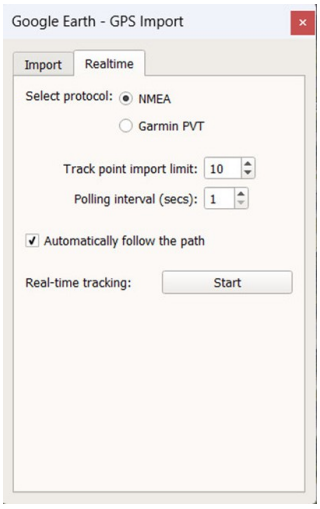
Google Earth Pro does not start automatically with the GPS dongle enabled.

We have to first click Tools and select from the new menu GPS.



A new window appears.

We do not need to change anything here. I tried, and it did not influence anything. We are interested in the next tab, Realtime. Adjust for 1 second polling and click Start. You need some patience, after which the map will start zooming more and more, until you have the Google Earth screen as I have it, with a blue dot in the middle of the map with Position written next to it.



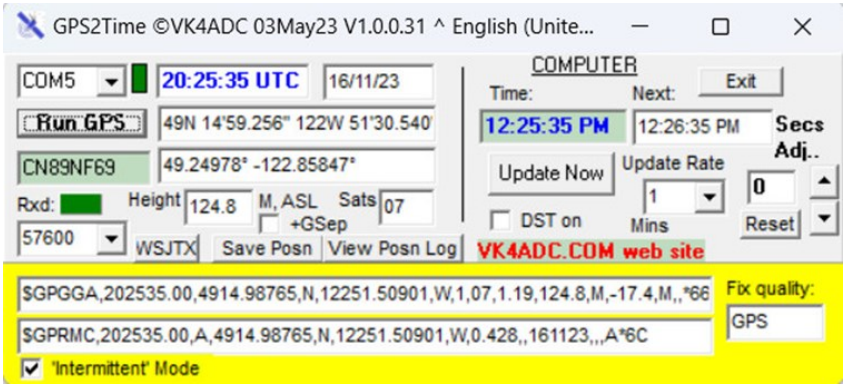
So, these $5 CAD GPS/GLONASS USB dongles do work. In this article we went from connecting the device, to seeing the received satellites, some statistics, and the end use of the dongle on a complex map, like the one Google Earth offers, with all kind of information layers and various displays, like road map, satellite view and so on.

I saw some radio amateurs “Use GPS to Ensure Your Best FT8 Time Setting” in a YouTube video:

https://www.youtube.com/watch?v=SWxc10je8HU

I confess I did not watch the video, but you might find useful information there. I headed directly to the software page belonging to VK4ADC and downloaded the GPS2TIME zip archive. I exploded the archive and got a portable exe program. Since it said that for some Windows versions it is required to run it as administrator, I did so, and I obtained:

The picture above right is self-explanatory. One must choose the COM port, and to press Run GPS. More explanations are on the author’s website.



Just keep in mind you need patience, and that you might need to start the Run GPS and maybe even Update Now buttons several times and wait about 30 seconds. It worked for me.

A 1 minute and 7 second video about quickly verifying the USB dongle:

https://www.youtube.com/watch?v=_w8iMzh_LkY

The sensitivity is better than -140 dB, some 0.1 microVolt. This lets the GPS/GLONASS USB dongle work even in difficult conditions I use it inside the apartment building.

~ Daniel VE7LCG

Need a 10 MHz frequency standard?

Question I Just finalized the foundation for my 1GHz dish and must fine tune my 3cm block, so I temporarily need a 3cm signal source. So far TX appears to working as it should But I'd love to have a signal source to fully check the RX part. Any ideas appreciated.

Answer If you have a Baofeng UV5R or similar, tune it to 432.0125 and it generates a lovely stable harmonic around 10368.2; it may be similar for other Baofeng models.

...more from

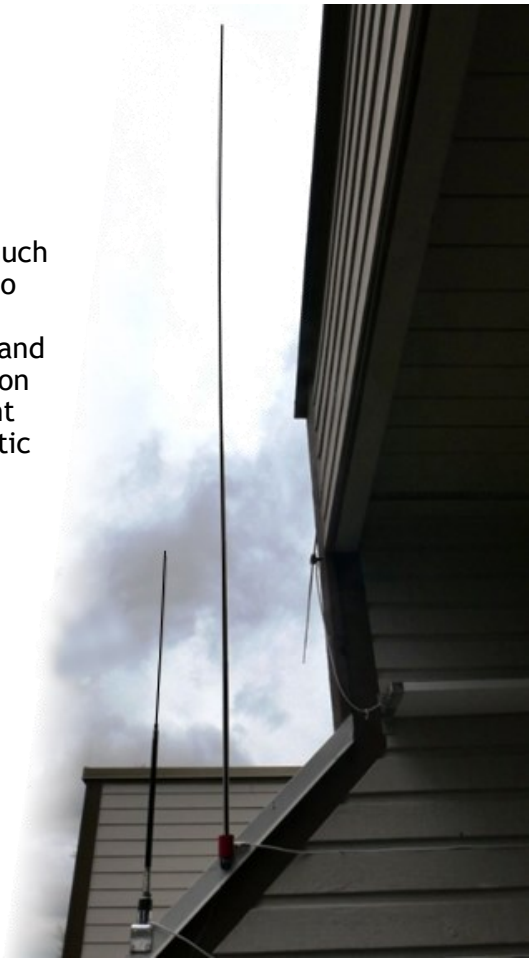
Daniel's Workbench

A shortwave vertical telescopic balcony antenna

Striving for a usable HF solution

Daniel Romila VE7LCG with an idea for apartment and condo dwellers wishing to get on HF.

by DANIEL ROMILA VE7LCG



Living in an apartment building pretty much kills the ability to enjoy shortwave radio activity. I cannot put in a long wire. A magnetic loop would be visible, expensive, and would require continuous tuning and direction adjustment. The building management might not be friendly anymore if I put up a magnetic loop structure. I survived a long time with a modified CB (Citizen Band) stick and some wire spread inside the balcony. It was very close to having no antenna at all, and I had problems receiving a local 28.197 MHz beacon, VE7MTY, located just several kilometers away.

I decided to invest in a telescopic 5.6-meter antenna, a UHF adapter, and the cable. It did not bring me wonderful amateur radio shortwave capabilities, but now I can at least say that I have something of an antenna, and I can do all kinds of experiments on an actual thing.

I've already made QSOs at 4,488 kilometers (Vancouver, Canada to Miami, Florida).

I made the purchase in August 2023, but I've updated the prices for November 2023 (they stayed the same, the exchange rate changed slightly). The following prices are with shipping and taxes included. I bought:

- 5.6 Meters 14 Section telescopic antenna $32 CAD (= 23 USD = 21 EURO = 432 ZAR)

- M10 Thread with an SO239 Base Adapter $18 CAD (= 13 USD = 12 EURO = 243 ZAR)

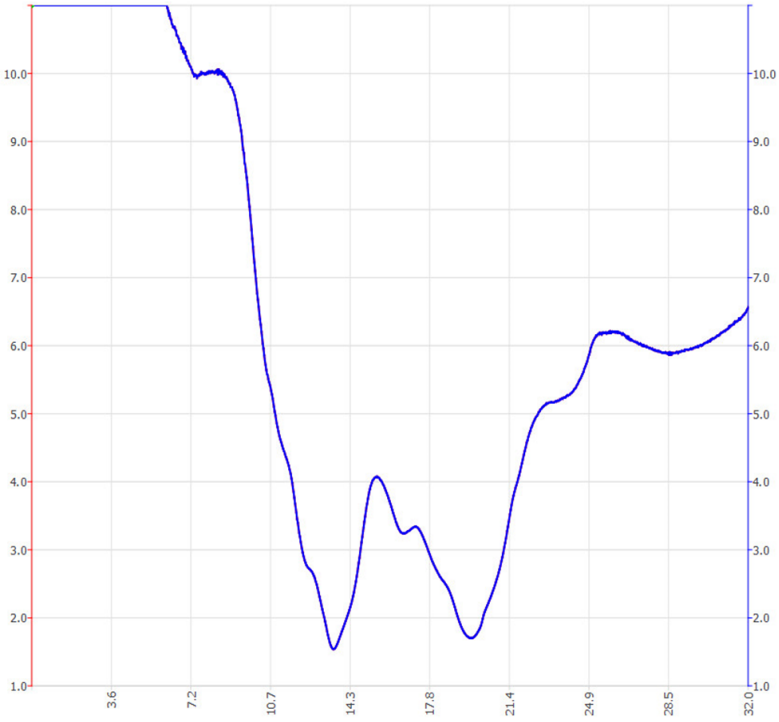
- 20 meters of RG58 cable, with UHF male connectors installed at both ends $30 CAD (= 22 USD = 20 EURO = 405 ZAR)

It was an investment. The advantage of having a telescopic antenna is that it can be retracted and is no danger to the building, it is less dangerous in a thunderstorm, and it can be easily adapted for various frequencies by adjusting its length and making measurements with a NanoVNA.

When it is retracted, the antenna is only 60 centimeters long. I was lucky to find a kind of musical instrument support on which I initially installed the antenna, anchored it in various positions on the balcony and searched for a radio sweet spot. Because I am at the top level of the building, I could extend the antenna directly towards the sky. Otherwise, I would have had to fix the antenna on the wooden outer wall of the balcony and extend it past the wooden wall of my upper neighbor. Initially, I settled for the right side of my balcony, using every piece of metal from the structure of my balcony as a counterpoise. If you repeat my project, you need to experiment with what works the best for your situation.

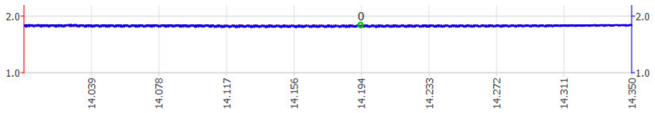
The final position for my antenna is as in the picture. I anchored it very well on the balcony rail.

For measurements I use a NanoVNA v2 (SAA2) and the program vnaQT, with 1024 measurements points, the maximum possible. There was a big variation (extreme) in measurements from the initial position to the final position, and I found that it is very important where you choose to install it on the balcony. General measurement, from 100 KHz to 32 MHz:

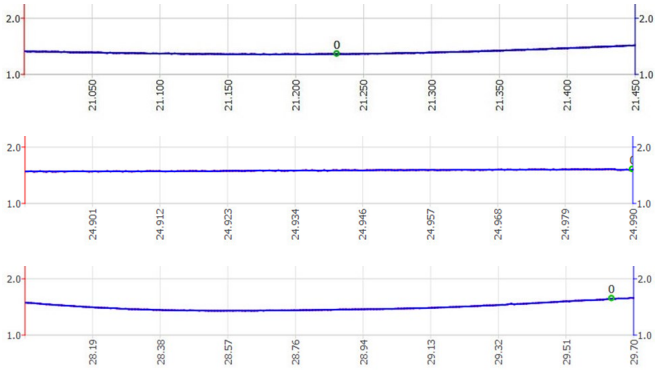


It promises to be adjustable for the 14 MHz band, which was the main purpose of installing this antenna. In the old position the telescopic antenna, fully extended, could have been used even at 3.5 MHz, at least according to the SWR measurements. That is deceptive though because those awesome results for such a low frequency were generated by too close a proximity to some metallic parts of the balcony. Please keep in mind that even 1024 measurement points for such a big interval (0.1 MHz – 32 MHz) cannot be enough, and smaller frequency intervals, with proper calibration on that interval, can show other values than in the general big graph.

It looks OK for the 20-meter band, with a SWR of around 1.83 almost constant across the whole band. The real lengths I have to adjust (extending or contracting the telescopic elements) pretty much respect the theoretical values for a vertical antenna, for one-quarter of the wavelength, in all successful bands (not 18 MHz though).



It cannot be tuned in the 18 MHz band. It has a bump of SWR=7 exactly there, and I cannot adjust the antenna to tune it.



I also tried to use this telescopic antenna horizontally as a long wire. While this 14-section antenna and its adapter are meant to be part of a horizontal dipole, I found the telescope bends so much that I do not think that it would remain intact for more than a few minutes. Anyhow, even putting it horizontally did not improve the reception.

***Note**: it is important to pay attention to how you install the red adapter cylinder. Installing it upside-down can put the telescopic antenna at the ground side of the cable. There is some kind of indication which side is GND, but it is best to use a multimeter to verify that the ground of the cable indeed connects to the ground/ counterpoise, and the hot centre of the cable is connected to the telescopic antenna.*

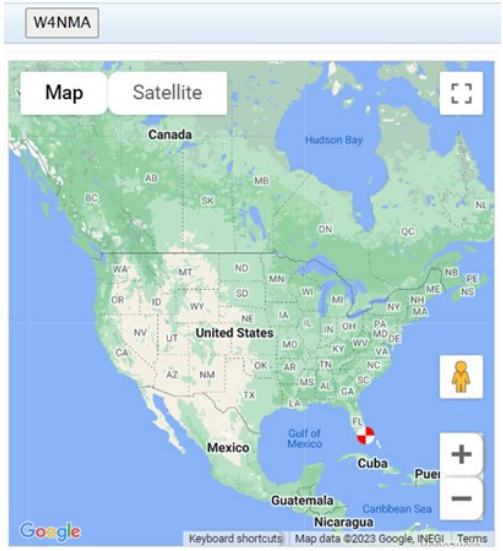
I would not praise this antenna very much. It is a desperate solution. I live in a suburb of Vancouver, at 130 meters above the sea level (the height of the street + the height of the building itself), with a clear view towards South, where the border with United States is located. When there is good propagation, I hear the closest two world beacons at 14.100 MHz. There is plenty of FT8 activity, but just a few CW and SSB stations.

While in other measurements, the NanoVNA instrument itself showed different values than when measured tethered and with the NanoVNA Saver computer program. This time, for this article, for this antenna measurement, all three versions (the instrument itself, the Saver program and VNA QT program) showed the same thing. Having the NanoVNA attached to the antenna and adjusting the length of the antenna (as it is telescopic), I can easily tune the resonant frequency.

Generally, in North America shortwave amateur radio activity is almost extinct (LOL). That is not to say that there are no radio amateurs and that there is no communication to be done. It is not only about the number, but also about the density of radio amateurs, age, and activity. Europe has a certain advantage here. I would not go as far to say that putting this vertical telescopic antenna on the balcony would justify spending some thousand dollars for a shortwave transceiver, but it definitely made a difference for my homebrewing experiments and receiving commercial shortwave and medium wave radio stations.

This article was written when I had only the antenna and a Chinese SDR RSP1 clone to play with. This version that you are reading has the measurements done after the antenna got to its final position and after I bought a quad band transceiver TYT TH-9800.

Now I have a more optimistic view about having the telescopic antenna because I made DX on 29.6 MHz, FM modulation. Using 50 Watts and this antenna I talked with N0CTY (Michael E Czech) from Vancouver to Minnesota, 2,134.5 km (1,326.3 miles). The biggest distance I succeeded in is 4,488.9 km (2,789.3 miles), and that is Miami in Florida, with W4NMA (Mark).



With a “neighbour” WB6RLC, Glenn from Cathedral City (close to Palm Springs), California, I continuously talked 5-9 as if he was in the same room with me, although he is 1,800.4 km (1,118.7 miles away).

~ Daniel VE7LCG

A detailed picture shows how I installed the antenna’s base adapter with a long M10 screw through the railing of the balcony.

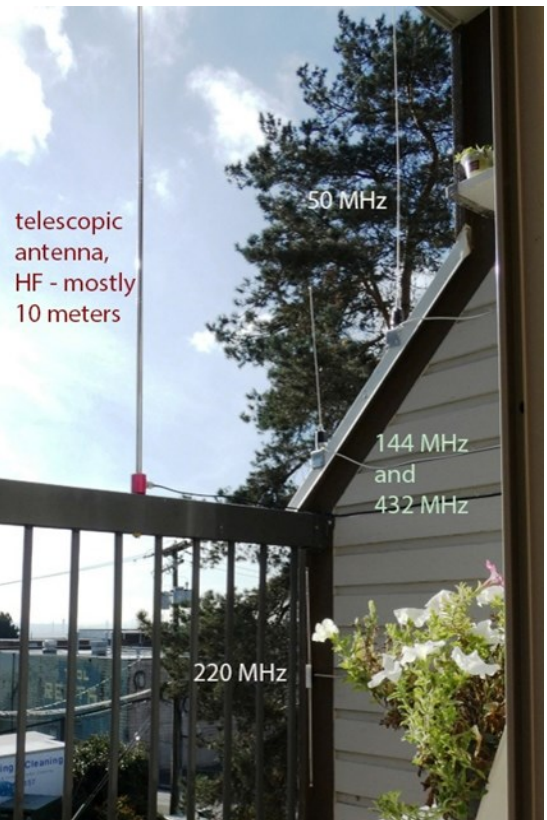
…more from

A 220 MHz balcony dipole antenna

Fed with 75-Ohm TV cable

by DANIEL ROMILA VE7LCG

Daniel Romila VE7LCG evaluates and experiments with a homemade 220 MHz dipole antenna.



I had a small space on the right side of my balcony, where there were three antennas already. Of course, a fourth one was needed (LOL). I made a dipole dedicated to only 220 MHz, a simple half-wave dipole from telescopic elements, and I fed it with TV cable. See the right lower corner of the balcony in the middle of the picture.

According to Wikipedia https://en.wikipedia.org/wiki/Dipole_antenna

The half wave dipole made with equal arms has an impedance of 73.1 Ohm in the middle. "If a half-wave dipole is driven at a point other than the center, then the feed point resistance will be higher. "

Wikipedia has a very good mathematical explanation. What it is important to keep in mind is that the dipole cannot have a feed point impedance lower than 73.1 Ohm, while many of us use 50 Ohm cable with no impedance adapter whatsoever.

Anyhow, the only available cable I had was some left over from the cable TV company. It was the only available cable I still had that was already passed through the wall out to the balcony.

The impedance in a coaxial cable is given by the distance between the central conductor, the shield and the dielectric constant of the insulator. The best coaxial cable impedances were experimentally determined at Bell Laboratories in 1929 to be 77 Ω for low-

attenuation, 60 Ω for high-voltage, and 30 Ω for high-power.

RG-58 has an actual impedance of 53.5 Ohms, not 50 Ohms. The cheap cable used by cable TV companies can be anywhere between 62 and 93 Ohm. Various articles can be found on the Internet about how to measure the characteristics of cables, but…

As is the experience of many amateur radio readers, I had a limited space on my balcony, very close to other metallic structures and affected by them (see the above picture). I had about 8 meters of cable, the cheap type abandoned by the TV cable company, and had no intention to precisely measure its length and eventually cut it to a certain length – as some technical people did and posted on the Internet – to make it look like a 50 Ohm cable. More information and specifications for cables can be found in many places, for example at:

https://www.rfcafe.com/references/electrical/coax-chart.htm

and

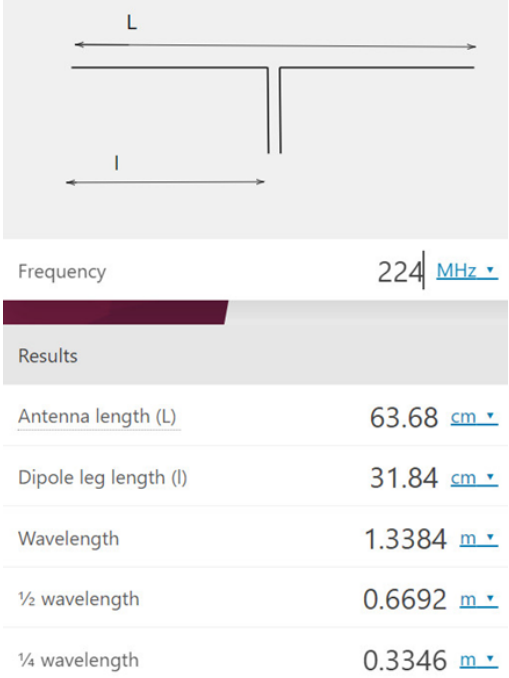
https://uk.rs-online.com/web/content/discovery/ideas-and-advice/coaxial-cable-guide

I started by calculating the length of the half wave antenna. I used the calculator available at:

https://www.omnicalculator.com/physics/dipole

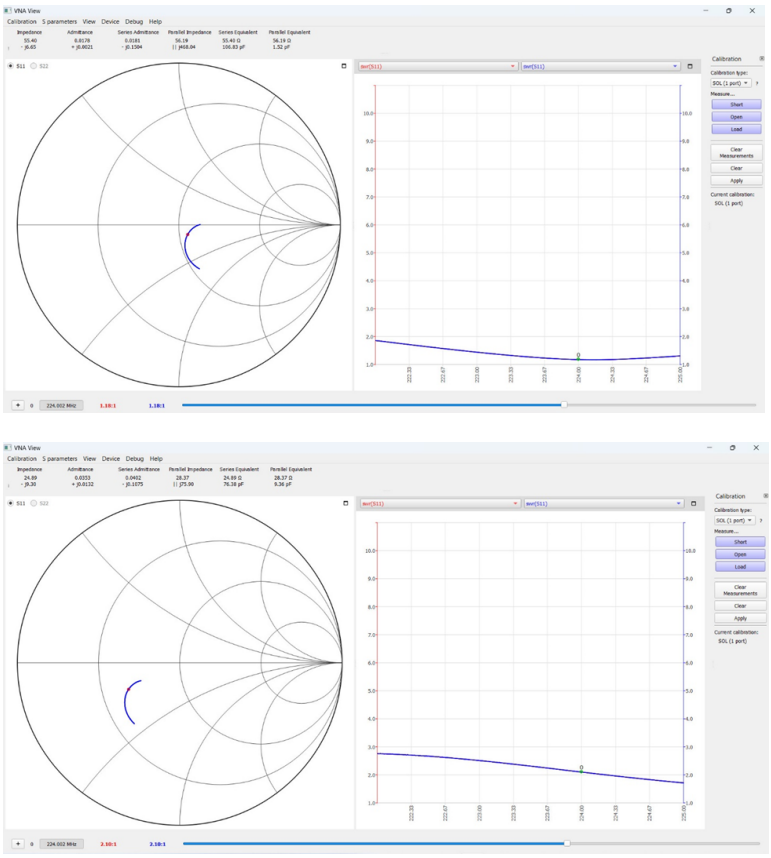
My telescopic elements allow me to obtain 32 centimeters or more for each arm. I already knew my antenna would not have equal arms, due to the metallic structures on the balcony, and this may happen to you too, if you decide to install a dipole as I did.

On my balcony, close to the rail, my dipole needed to be only 61 centimeters long. The arms are not equal; one is 33 cm and the other is 28 cm. Those values come from hours and hours of adjustments. This is why I use telescopic arms for my dipole antennas. The end result is a SWR of 1.18 at 224 MHz.



Top: The NanoVNA result when calibrated for 50-Ohms, the end result is a SWR of 1.18 at 224 MHz.

Bottom: The NanoVNA result when calibrated for 75-Ohms



Top: Smith chart result when calibrated for 50-Ohms, the end result is a SWR of 1.18 at 224 MHz.

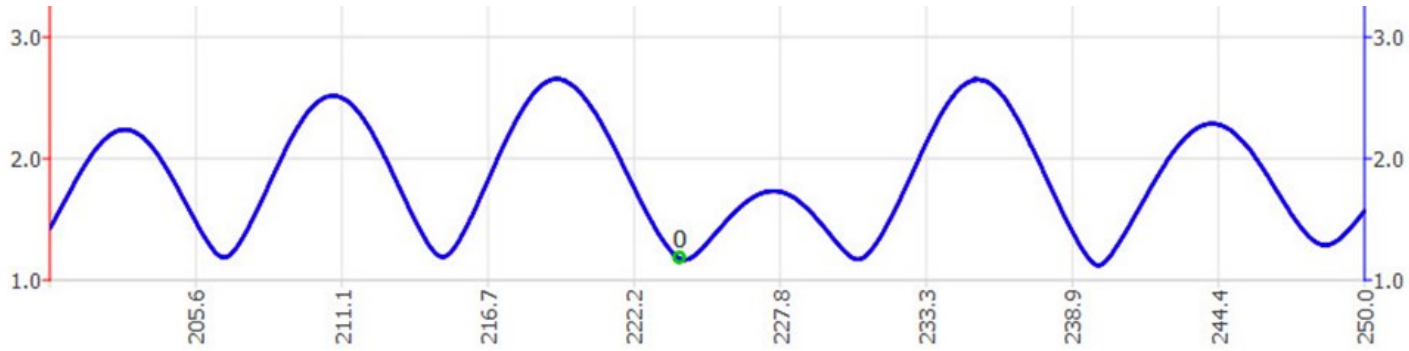
Bottom: The Smith chart result when calibrated for 75-Ohms

I favored the upper part of the 220 MHz band, where the repeaters are. I made all adjustments for 50 Ohm impedance, since this is what I will finally use it for. My walkie-talkie that has the 220 MHz band is a Chinese MML UV-8DR, that accepts a wide range of impedances. It does not burn-out even when used in Tx with no antenna at all, something that it is also known to be true for the Baofeng UV-5R.

Just for the sake of experiment, I calibrated my software vnaQT, used in a Windows computer for tethering a NanoVNA v2 SAA2, for 75 Ohms too. At the bottom of the previous page is what I obtained when changing to that calibration, without modifying the antenna and its cable in any way. It looks like the antenna is too short when using the 75 Ohm calibration (see above that my antenna result in practice was shorter than in the theoretical calculations).

Just for the sake of experimenting, left are the full screenshots for 50 and 75-Ohm calibration.

It is always good to be in a “valley” in the SWR graphic. One can have a better idea if the measurements are made for a wider range of frequencies, a little outside of the wanted band. There are two “valleys” left and right of 227 MHz. I could not move the right “valley”, so many things from the graphic are the result of the metallic structures on my balcony and I cannot influence them, while the graphic might call for some action(s). Below is the graph for 50 Ohm calibration.



And on the right for a 75 Ohm calibration.

My dipole antenna is definitely influenced by the metallic structures around it on the balcony, and I cannot stress that enough. All the calibrations and measurements were done using 1024 points.

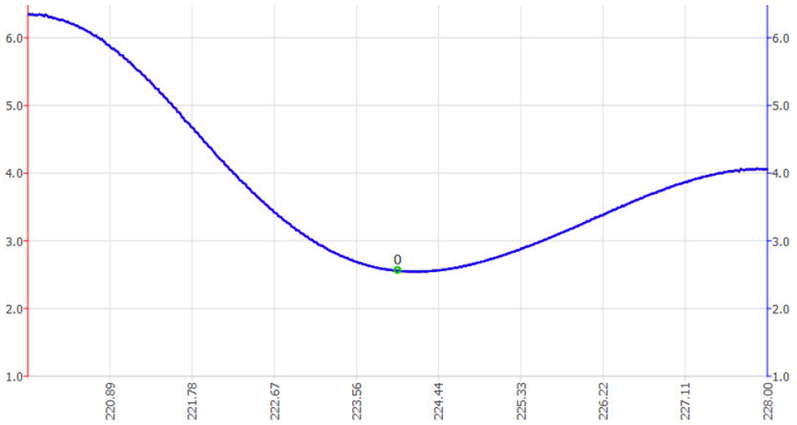
What I learned from this experiment making a telescopic balcony antenna for the 220 MHz band:

The real total length of the dipole is shorter than in the theoretical calculations. This was always my case, in all the dipoles I made.

For the best SWR, the lengths of the arms are not equal. See the picture previous page.

Good SWR can be obtained with other cables than the traditional RG58, even with cheap recovered TV cable.

Use of telescopic arms allows for a very fine adjustment of the practical results, especially if the place has metallic components around and unexpected differences in the lengths of arms that must be adjusted. (Adjust and adjust, but never cut – LOL).



I use this antenna with a walkie-talkie which has only around 2 - 3 Watts power in the 220 MHz band. The cable is about 8 meters long, a cheap TV cable left over. The furthest repeater I can reach from Coquitlam (a suburb of Vancouver, Canada) is W7ECG, at 78.3 kilometers from me.

~ Daniel VE7LCG

50 MHz antenna for TYT TH-9800 50 W
144-220-432 MHz antenna for walkie-talkie MML UV-8DR
HF and 50 MHz antenna telescopic
144 MHz antenna for Kenwood 7950 - 45 W
144 and 432 MHz antenna TYT TH-9800 50 W
On the inside wall, 3 vertical dipoles in parallel for air TV and 88-108 MHz radio

...more from

Experimenting with solar panels

Rescued solar LED garden lights

by DANIEL ROMILA VE7LCG

Daniel Romila VE7LCG
A seasoned experimenter, Daniel investigates uses for used LED solar lights.

Every time I find some electronic devices thrown away; I ask myself what I can do with that device. There are many things to learn and to experiment with, which is part of our hobby.

I sympathized for a long while with getting a solar panel for power supplying some amateur radio toys. Experimenting with a solar panel would require some investment. For example, an 80 * 75 * 2.8 mm solar panel, with maximum 0.9-Watt output, maximum 450 mA output, with some 2.5 V open voltage and 2 V when charging, would cost me around $4 CAD (2.9 USD = 2.75 EURO = 14 ZAR) in November 2023, shipping and taxes included.

Faced with making an investment for close to nothing, because I live in Vancouver (Canada) where there is little Sun all year long, I paid attention to another picture I saw on the website, close to the solar panel ad. It was showing a complete device, a kind of lighting device for when it was dark outside, and with a solar panel charging a rechargeable battery inside during the bright days. They look like this:

I decided to find some garden solar lights that people no longer use, disposed of in the garbage. That is easy to find in Vancouver, because the internal rechargeable battery seldom has enough daytime light to be fully charged and to supply the LED for the night, so people think they are damaged and throw them away. Another solution would have been to buy a ready-made solar power bank.

They are more expensive, and many people bad mouth them they do not even contain the whole electronics to work (which I did not verify).

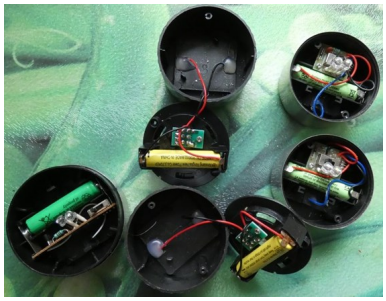
So, I came back to plan A, and from the garbage I rescued some garden solar lights, five of them.

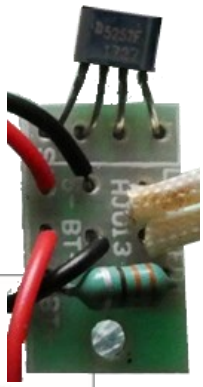
After opening the devices, I could access the battery (AAA size, Ni-Cd), the electronics, based on an ASIC (application specific integrated circuit), the LEDs for lighting at night, and the solar panel I wanted to play with. Some of the devices have an ON/OFF button, some don't.

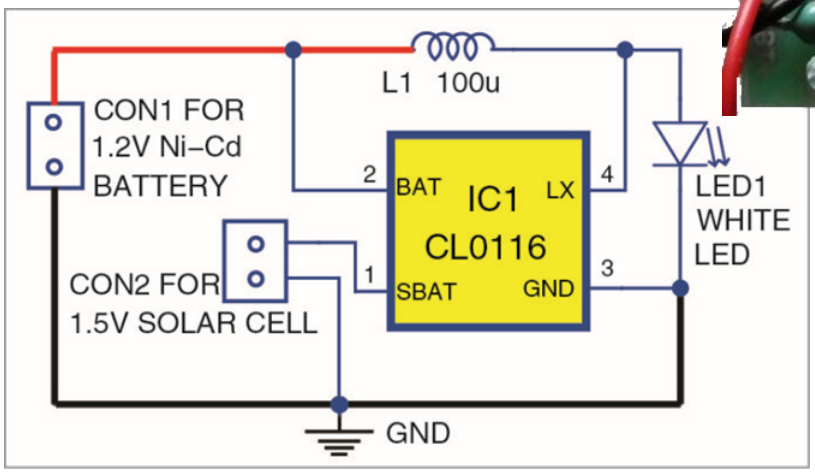
Below is the typical electronic schematic for such a garden solar light from: https://www.electronicsforu.com/electronics-projects/garden-solar-light

The first thing one notices in the above schematic is that the LED is permanently connected to the Ni-Cd battery, through L1. No, the LED will not continuously be lit, because the voltage applied to the LED, the 1.2 V minus whatever is lost on L1, is not enough to make the LED lit.

The most used ASICs are CL0116, QX5252F, ANA608 and YX8018. From the datasheet, CL0116 can provide a maximum 0.8 A for the LED, and the whole schematic works even if the battery is low, at 0.8 V.







L1 is part of a switching power supply that will provide some more than 1.8 V to the LED.

The first thing I did was to take out the Ni-Cd and I saw they are 1000 mAh. While forcing the battery support to remove it, one device started to light at the maximum. It was a surprise to see the Ni-Cd still has charge, because the contacts were so oxidized that I expected years of use and misuse. I remember some SAFT Ni-Cd batteries that I found after 10 years lost in the furniture (they fell off the drawers, behind the drawers). They were still charged after 10 years, and ready to use.

This is the maximum I could obtain from the solar panel in a rainy day in Vancouver: 2.19 V and 180.7 microA. Not enough. In Vancouver I need much bigger panels, to supply power to amateur radio equipment.

I could charge all 5 Ni-Cd batteries to over 1.34 V.

~ Daniel VE7LCG

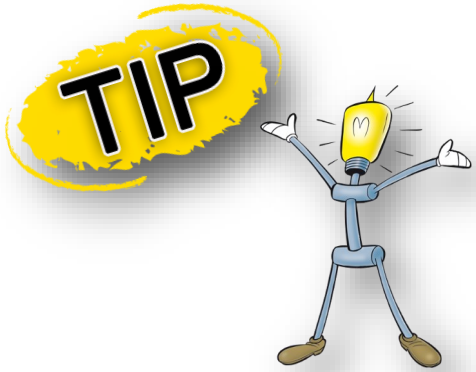
How to replace the cable in an NMO magnetic base

by Daniel Romila VE7LCG

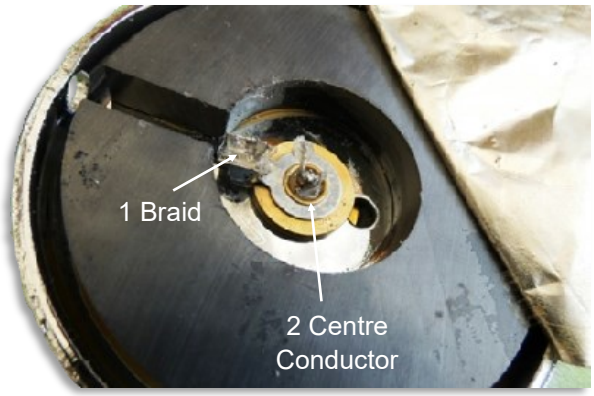
I had an NMO magnetic base with too short a cable (3 meters) attached to it. 3 meters would be enough for using it above a car, but not enough on my balcony. I do have plenty of cable, so that was not an issue. I could not find information on the Internet for what I should expect inside such a magnetic mount, so I took pictures while I worked on it to write this article.

The base has a glued foil where it touches the magnet on one side, and a non-glued part to the exterior, the side that will touch the surface on which the mount will be attached.

In the picture I already removed the wax cork that protected the cable solder connections. No matter what you do, the wax cork will be damaged. It is important to just take it out – for the moment – to have access to all the points to re-solder a new cable.



As you can see from the picture on the right, there are two points to solder: the inner part of the cable, and its braided ground. The ground part of the cable is also mechanically fixed on the magnetic mount, so it is very difficult to unsolder, and requires a lot of heat to remove the cable.



I simply cut the inner part of the cable, so as not to be forced to try to unsolder one side of the cable, while the other part would have interfered with my removal.

To protect the solder connections and the cable from water and moisture, the wax cork must be placed back. I put the wax back as best I could (first), and afterwards I heated it with the soldering gun drawn into the wax. I cleaned everything after this picture was taken. It is important to replace the magnet and the wax cork in one plane for the magnet to have maximum surface interaction. The wax becomes fully transparent when melted. Do not exaggerate the heat, because too much heat can damage the magnet and the cable. I flooded the cable part with wax and I added glue on the magnet and edges, to seal them. I also flooded the hole for the cable with glue.

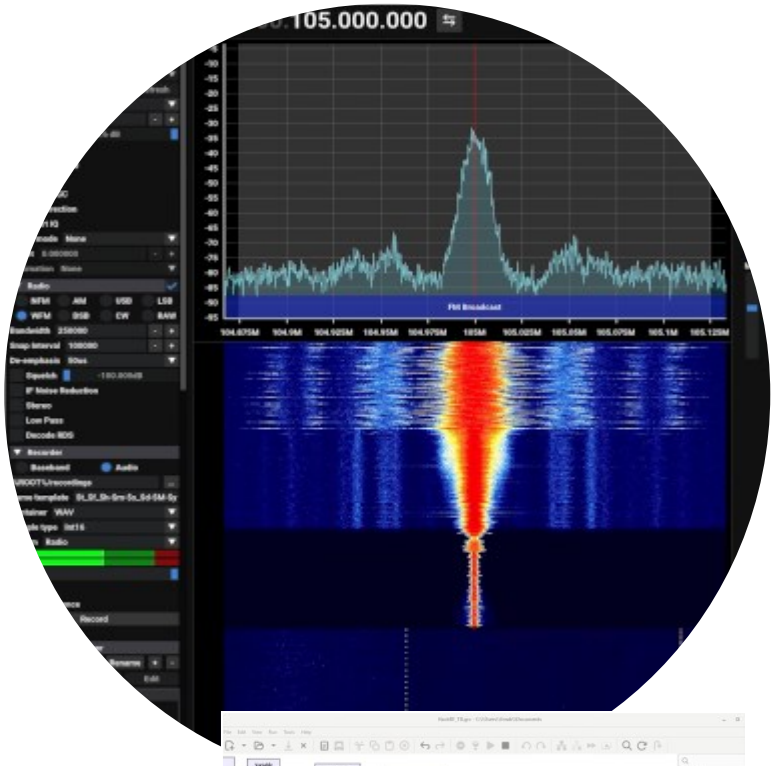
At the end I put the foil back over the magnet, and stretched every little point that did not look like it was in the single common plane.

After I finished, I installed an antenna on the balcony and measured, to see everything was OK.
I also had quality control help from one of my friends, a hummingbird that lives nearby and often spends time with me.

~ Daniel VE7LCG

A recent Saturday Denny's group. Come join us!

Tech



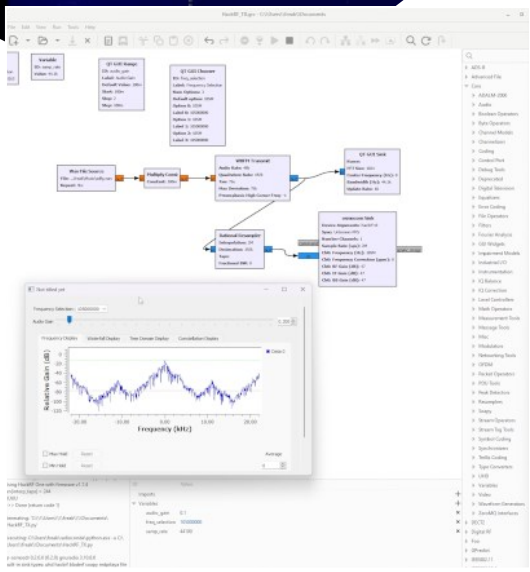
Roll your own SDR

GNU Radio may be for you

by AL WILLIAMS—HACKADAY

Al Williams is a regular contributor to **HACKADAY**. You can see this article and many others there: [Roll Your Own SDR | Hackaday]

If you have software-defined radio hardware and you are only using someone elses' software, you are missing out on half of the fun. [Tech Minds] shows you how easy it can be to roll your own software using GNU Radio Companion in a recent video.



GNU Radio usually uses Python, but with the companion software you rarely need to know any actual Python. Instead, you simply drag blocks around to represent filters, DSP processing, and other functions you need to create the processing for your application.

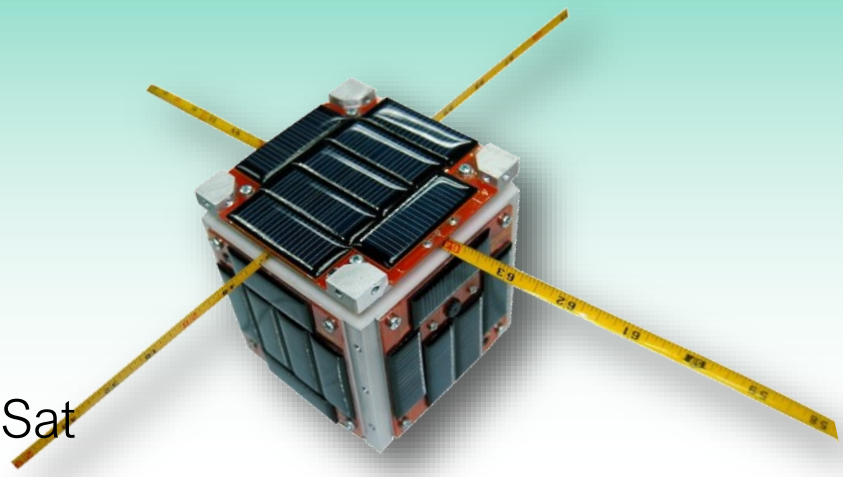
Click to watch on YouTube

It is very simple to create sophisticated user interfaces with waterfalls, spectrum analyzers, filters, and more. The example in the video is a 40-meter receiver using an RTL-SDR. Of course, given the right hardware, GNU Radio will work with any frequency, from audio to anything you can get into your PC.

We have our own video series on GNU Radio, which hasn't changed much over the years. Ours starts with audio since it is a good bet you have a sound card. Later, we graduate to using real RF hardware. While you usually think of GNU Radio as a radio receiver or transmitter, it also makes a fine custom signal generator.

~ Al Williams
Hackaday

Satellites



SDATV Project 2023 CubeSat

By MARIO KD6ILO

Our 2023 CubeSat project that had been planned in early spring of 2022 is coming along very well as announced by its project manager Brian Copeland and his team including our STEM helpers. Funded by the National Science Foundation and the support of the component supplier https://www.aacclyde.space/.

My part is systems integration and testing, it's a 3U structure with a PC/104 form factor and a system bus allowing modules to easily be stacked and routed. It will be using the S-Band for tracking, telemetry and control {Module 2} out of six. I will be working on Module 6 {camera/tranmitter}.

~ Mario, KD6ILO,
San Diego DATV Society

TV Repeater's REPEATER

ATV from high altitude balloons

Your questions answered

by JIM ANDREWS KH6HTV

Jim Andrews, KH6HTV publishes the free TV Repeaters Repeater newsletter via email. All past issues are archived at: https://kh6htv.com/newsletter/

We recently got this inquiry via the DATV users group from a ham in British Columbia, Canada.

I just joined the group in hope some members might have some ideas for our project. We are launching our second hydrogen balloon with cross-band repeater, and APRS on it in the new year. It goes to 100,000 feet before descending by parachute... total time of flight around 3 hours. We are thinking to add a camera and possibly would like to send a photo to the ground every x seconds (much determined by battery power available). Is there anything in the amateur tv world that might help without breaking

the bank? If not, any other ideas from the consumer market? Here is the URL link to our balloon group: https://www.ve7nfr.com/pico-balloons.html

Thx, 73, Adrian VE7NZ

There were several replies for others in the users group. We felt they were worth while passing on.

Roger VK5YYY replied -- "Have a look at this Adrian https://www.areg.org.au/archives/category/horus-datv"

Jim - G7NTG replied -- "Why not use a drone camera at 5665 MHz ?"

Dave - G8GKQ replied -- "Hi Adrian -- We have been unable to do fast-scan ATV from a balloon in the UK due to licence restrictions, but it sounds like you are thinking of what we know of as SSDV (Slow Scan Digital Video). There is lots of info here: https://ukhas.org.uk/doku.php?id=guides:ssdv.

I'm sure that you will find the rest of the Wiki useful as well. There is a group in the Netherlands that does an annual launch of a balloon with fast scan digital ATV, but you probably would want to get some experience with SSDV first."

Noel- G8GTZ also replied -- "The UK High Altitude Ballooning (HAB) community has been doing this for some time using a system called SSDV. https://ukhas.org.uk/doku.php?id=guides:ssdv

Your TV Repeaters Repeater editor, KH6HTV, also sent Adrian a lengthy email reply including references to all of the articles we published here in this newsletter last spring on the subject. They included issues #s 124, 125, 126, 127, 128 & 135.

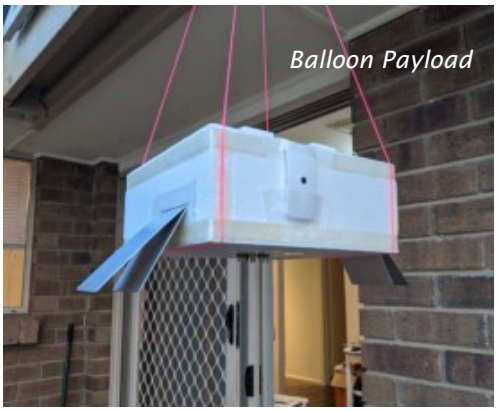
The above URL link to www.areg.org.au is very interesting. It is very good documentation of a balloon flight in 2021 which included live video using DVB-S on the 70 cm band.

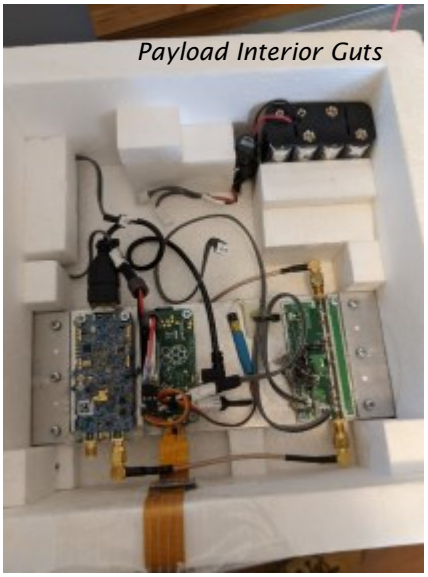
Here are a few key details. We recommend you look at the complete web site for full details.

The DVB-S payload was the primary experiment on this flight, and developed by Mark, VK5QI, and Peter, VK5KX. The payload utilised a Raspberry Pi Zero W to capture and compress video (using F5OEO's DVB-S encoder and natsfr's LimeSDR Gateware – this project would not have been possible without their work – thanks!). This was then modulated as a 70cm (445MHz) DVB-S transmission using a LimeSDR Mini. The signal was further amplified to ~800mW using a LDMOS-based power amplifier. The overall power dissipation in the payload was ~6 watts, so a heat-spreading and heatsinking system was built by Peter, including custom-milled interface plates for the LimeSDR. The final DVB-S parameters used for the flight were: Frequency = 445.0 MHz, Mode = DVB-S, Modulation = QPSK at 1 Msps, Forward Error Correction = 1/2 and Video Resolution = 720 x 404.

~ Jim KH6HTV
Reproduced with permission

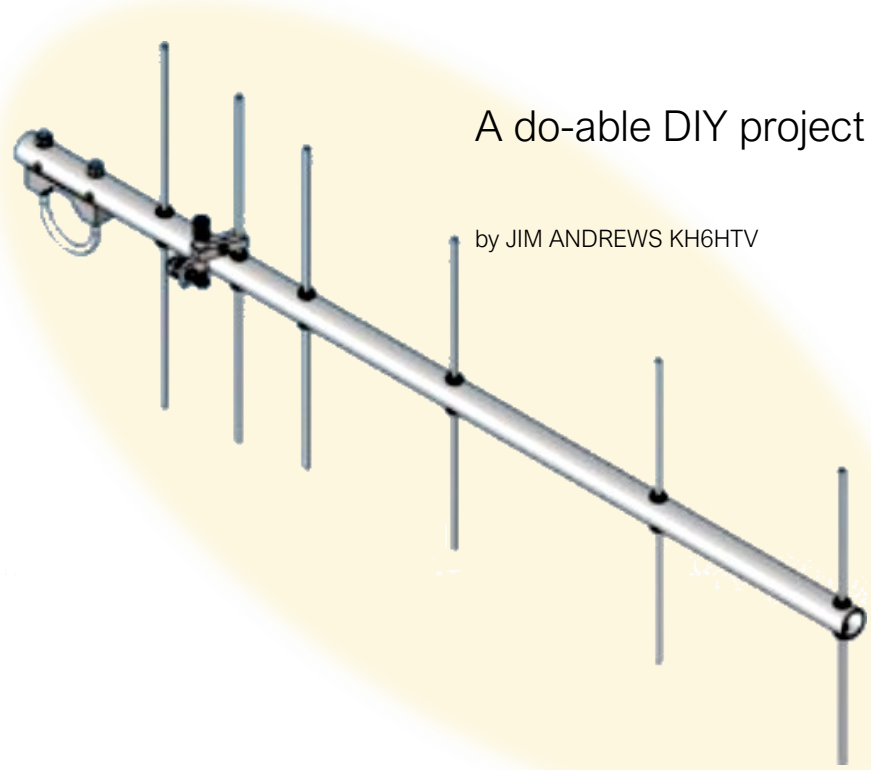
Last video image from space before balloon burst


Balloon Payload


Payload Interior Guts

70cm Tracking Antennas

Your own 70cm Yagi Antenna



A do-able DIY project

by JIM ANDREWS KH6HTV

While the M-Squared 440-6SS Yagi is my personal favorite, broadband, Yagi for 70 cm, it has recently gotten quite expensive at US$169. It previously sold for many years at US$100. The construction of it appears to be quite simple and could be duplicated in your own garage work shop. The Yagi consists of a total of six elements. They are a driven element, one reflector element, and four director elements. The elements are 3/16" dia., solid aluminum rods appropriately spaced on a 3 ft, 1" dia. boom.

I have measured them on my own antenna. Here are the lengths and their respective positions relative to the driven element.

#1 Reflector: 34.7cm (-8.3cm)

#2 Driven Element: 33.1cm (0 cm ref)

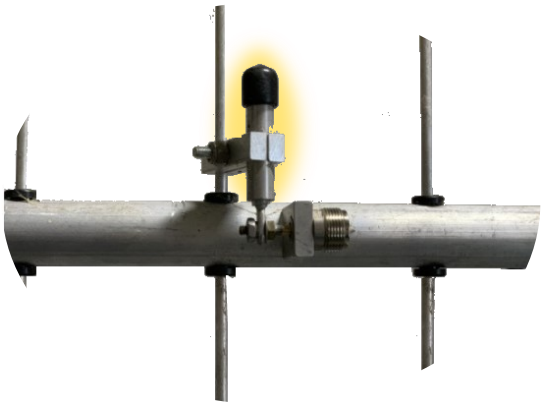
#3 Director: 30.7cm (7.4cm)

#4 Director: 29.6cm (23.7cm)

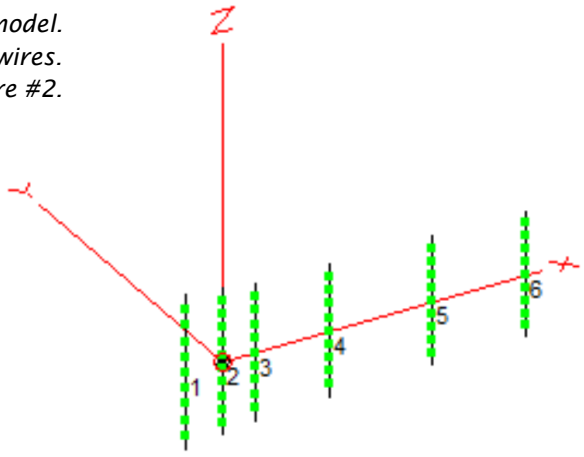
#5 Director: 28.8cm (46.3cm)

#6 Director: 28.2cm (66.7cm)

M^2 does not electrically attach the rod elements to the support boom. They pass through the boom and are held in place with insulating plastic spacers.



EZNEC Modeling: *The M2 Yagi is an easy one to model. Simply enter the above data into the wire table for a total of 6 wires. Place the excitation source in the middle of wire #2.*

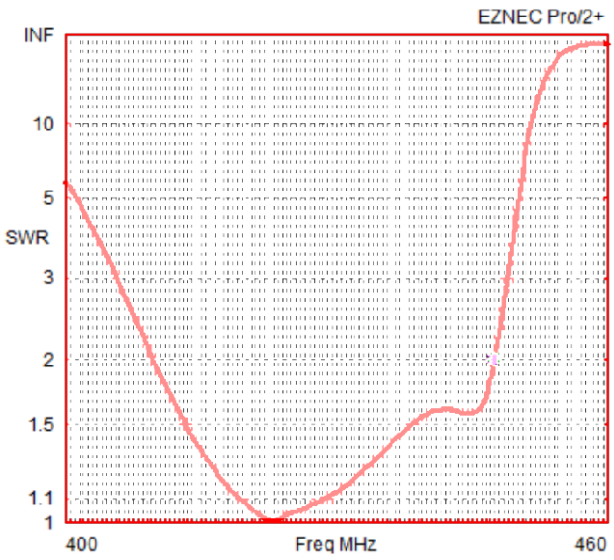


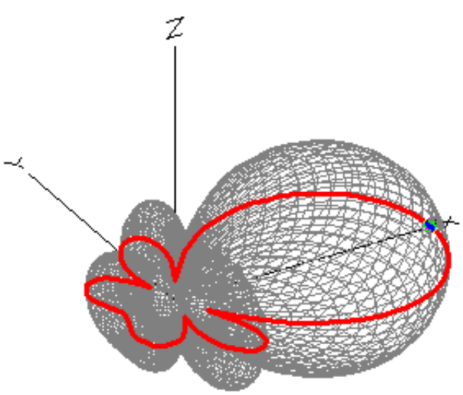
There is a close-up photo of the construction of their Z - matching Gamma match and the UHF coax connector showing how they are attached to the boom and the driven

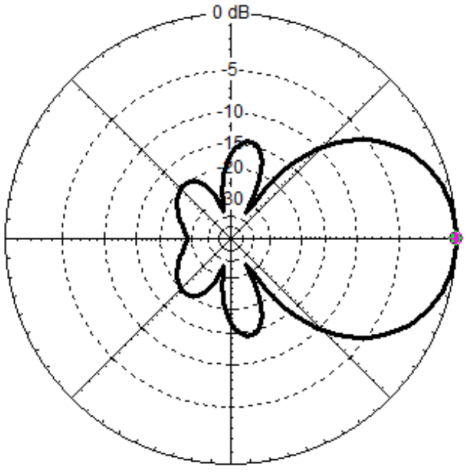
The following is the predicted performance in Free Space. The VSWR plot shows the min. of 1.41:1 (-15.3dB RL) at 425 MHz with an impedance of about 35-36 Ω. Thus showing the need for the Gamma Match. If we then assume a gamma match is used and then replot the VSWR using a ref. Z of 35 Ω we get this plot with a min. VSWR of 1.006 at 423 MHz. The < 1.5:1 BW is 413-439 MHz. The < 2:1 BW is 410-448 MHz. The free space far field calculations show the below plots. The max. theoretical, free space gain is +11.5dBi, essentially the same as the M^2 specs.

On my real M^2 Yagi, I measured a VSWR min. of 1.2:1 at 436 MHz, < 1.5:1 (416-446) & < 2:1 (410-453 MHz) & < 3:1 (408-457). My measured < 2:1 band-width very closely matches the EZNEC calculations. These indicate that it should be a good antenna over the whole 420-450 MHz, 70 cm amateur band.

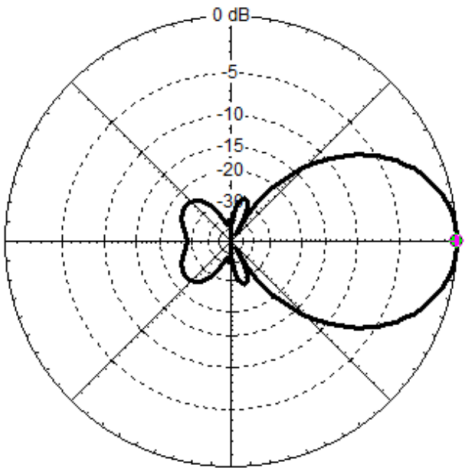
~ Jim KH6HTV
Reproduced with permission







Azimuth Field Pattern



Elevation Field Pattern

RAC News

Youth On The Air Camp Comes back to Canada!

Radio Amateurs of Canada (RAC) is the national association for Amateur Radio in Canada. It is a not-for-profit membership association with its headquarters in Ottawa, Ontario, Canada, representing the interests of Amateur Radio across Canada.

Radio Amateurs of Canada represents all Canadian Amateurs at all levels of government. Speaking on behalf of Canadian Radio Amateurs, RAC provides liaison with government agencies and carries the Amateur voice about regulatory and spectrum issues to the discussion table with government and industry leaders, nationally and internationally. RAC is the Canadian voting member society of the International Amateur Radio Union (IARU).

Radio Amateurs of Canada is pleased to announce that the Youth On The Air (YOTA) Camp will once again be held in Canada!

Attention all young Amateur Radio operators! YOTA Camp is back and better than ever! After the success of the YOTA Camp in Ottawa in July 2023, Radio Amateurs of Canada has teamed up with Youth On The Air Americas to bring YOTA back to Canada.

YOTA Camp 2024 will be held at the Mount Saint Vincent University campus in Halifax, Nova Scotia from July 7 to July 12. Modelled after the successful Youngsters On The Air program in Region 1 of the International Amateur Radio Union (IARU), this will be the fourth YOTA Camp in the Americas with past camps being held in Cincinnati, USA (2021 and 2022) and Ottawa, Canada (2023).

YOTA Camp is open to Amateur Radio operators between the ages of 15 and 25. A total of 50 campers will be accepted to this year's program, an increase from last year. Don't miss out on this incredible opportunity!

Come to YOTA Camp and we'll teach you all kinds of cutting-edge technology that can be used with Amateur Radio and connect you to other young operators and mentors in North, Central and South America. Through this program, young Amateurs will learn and practise essential skills taught through STEM principles such as electronics and radio wave propagation. The program will also prepare young Amateurs to contribute during emergencies and provide numerous opportunities in their own communities and future careers.

Are you already an expert? We are seeking young Amateurs who are willing to take their knowledge to the next level and share their past experiences with other young Amateurs. The camp will primarily focus on building strong relationships with peers and

mentors, as well as developing new radio skills. Campers will operate a special event station featuring cutting-edge HF and VHF/UHF radios and a wide array of antennas that many only dream of using.

Applications are now being accepted! Applications submitted by January 15, 2024 and first-time attendees will be given priority. We will accept applications through May 31, 2024.

The application process is free. The cost of the camp is $100 USD plus transportation to and from the Mount Saint Vincent University campus. The $100 USD fee will not be payable until after acceptance. Should a potential camper not be able to afford the fee, they may apply for a scholarship or waiver.

Sponsorship: This is an excellent opportunity for Amateur Radio clubs to help build the leaders of tomorrow. Radio Amateurs of Canada is also pleased to introduce the new "Send A Youth to Camp Campaign" which will run from February 1 to June 1 in which proceeds collected will be disbursed to assist campers with travel expenses. More information will be available in January on the RAC website.

Important: YOTA Camp 2024 organizers will provide updates on our website and through social media if there is any impact on the camp such as the need to reschedule.

For complete details about the camp and/or to sign up for updates by email, please visit the camp webpage provided below or contact yota2024@rac.ca.

For additional information, please contact:

Camp Director Neil Rapp, WB9VPG: director@youthontheair.org

YOTA Camp 2024 – https://youthontheair.org/halifax2024/

Youth On The Air – YouthOnTheAir.org

~

Former RAC President Daniel Lamoureux, VE2KA SK

In addition to serving as RAC President, Daniel was also a member of the Administrative and Finance Committee for several years. He also served as Area A Director of Region 2 of the International Amateur Radio Union (IARU).

Daniel served as President of the Fédération des clubs radioamateurs du Québec (RAQI) for several years from the mid-1990s to the early 2000s. Please stay tuned to this website for more information.

Phil McBride, VA3QR – RAC President and Chair

Around the GOTA Corner

An Elmer is a Collaborator

Not a crutch

by LARRY BLOOM VE7LXB

Larry Bloom, VE7LXB is a retired high school teacher who passed his Amateur Radio Basic with Honours in late spring 2022. Larry is the SARC New Ham Coordinator as well as a Director with SARC and is passionate about helping new hams get started in Amateur Radio.

One of the many things I love about Amateur Radio is the way we share our expertise. As a newbie lacking electronics experience, I would have been lost without the support of our club Elmers. Truth is, I may have given up that first year without help from our SARC members.

I enjoyed the Amateur Radio Certification Course and learned a ton, but radio, antenna, and propagation theory will only take you so far. After all, my respectable exam mark didn't solve what I thought was a multipathing issue last week.

As we all know, joining an amateur radio club adds value beyond the social benefits. Club Elmers help solve stubborn power supply issues, assist with attic antenna installations, make recommendations on radio purchases, and take the lead on POTA excursions. All newly minted GOTAs should consider joining a club and finding an Elmer. It's a no-brainer.

But I've learned something else about Elmers. Something important beyond the technical assistance that I've received.

Don't use your Elmer as a crutch.

John VE7TI, a SARC Director, course instructor, and editor of The Communicator has been my go-to Elmer since graduating. John has been invaluable in helping me overcome ham-related obstacles. He kept me in the game during those first few months of frustration. He spent hours helping me set up my rig at home.

But lately, John's been giving me something even more important than his knowledge and expertise. He's

forcing me out of my comfort zone. John senses that, because I lack experience and a background in electronics, I am reluctant to take a hands-on approach. He recognizes that plug and play is my fallback position and is now pushing me to solve puzzles on my own.

Instead of crimping and soldering for me, John is encouraging me to learn these skills myself. Recently he embarrassed/ motivated me into signing up for our soldering workshop. Next on my list will be soldering and crimping coax connectors.

I'm learning that DIY is not only good for the ego, it also gives one the confidence to attempt even more challenging projects. Surely, we learn and retain more when we do it ourselves.

So GOTAs, find a club and connect with an Elmer. But never forget that at some point you'll have to prove that you can do it yourself. After all, an Elmer role awaits you in the not-to-distant future.

~ Larry VE7LXB

The unseasoned ham

Our SARC GOTA initiative continues to gather momentum. Our most recent GOTA Net had a dozen newbies check in and our next GOTA Workshop in January is almost fully registered. The word seems to be spreading as many of our Net and Workshop attendees are not recent course graduates. Apparently, they have been referred to us by friends In the Amateur Radio community. I'm happy to report that many of our active GOTAs are of feminine persuasion and their numbers are growing. We presently have eight very active new female GOTA operators in our plucky group which presently numbers close to fifty overall.

Upcoming GOTA Nets will have a new format. John VE7TI will introduce a new topic each month that may be of interest to new hams. Participants may query John on the topic during the Roundtable. Our first topic was on DMR radio. Of course, participants may also choose to update the group on their progress or pose any ham-related questions to the Elmers who are on-air that evening.

The results are in! I am excited to announce that our GOTA representation during this year's Field Day was a HUGE success. Combined with our regular SARC QSO's in the 2F category, we placed 1st in Canada and 3rd overall in North America. Details on how this was accomplished can be found on page 12 in this issue.

73

~ Larry VE7LXB

From the estate of VE7DYR… I'll bet we won't see a cover like this again.

Where is The Communicator read?
North Atlantic Ocean
South Atlantic Ocean
Indian Ocean
Now read in 145+ countries and
our last issues had over 22K downloads!

Ham Radio

Outside the box

Using a Municipal Flagpole for an Antenna

Fine Business!

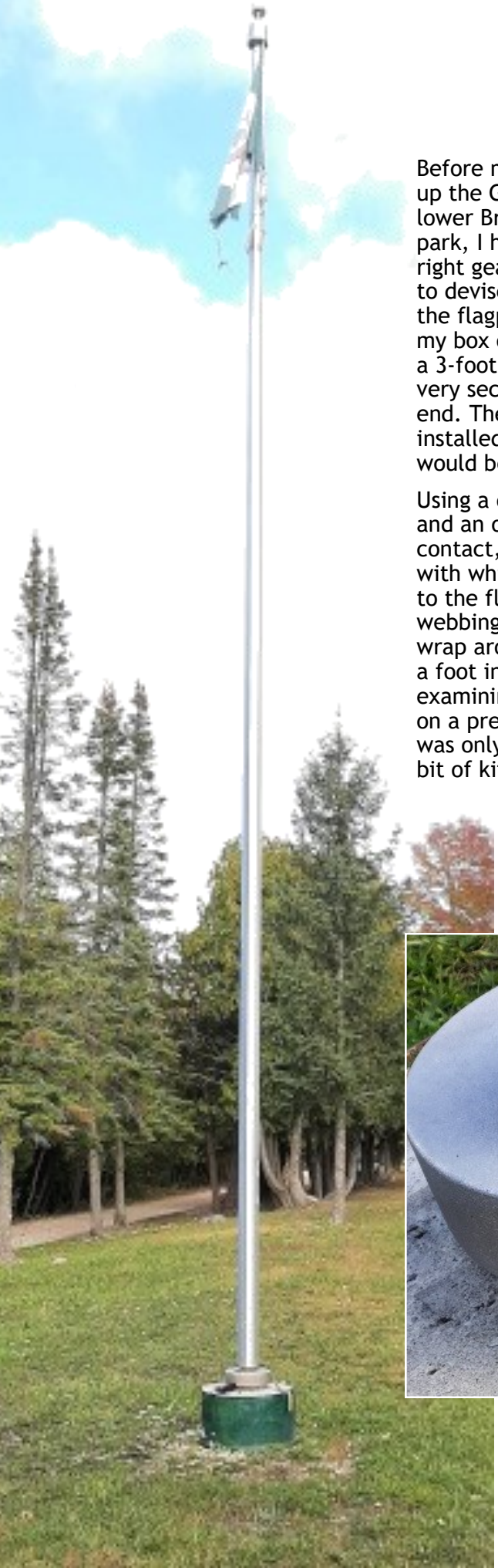
by JOHN CORBY VA3KOT

John Corby VA3KOT resides in Owen Sound, Ontario but is more often found operating CW out in the "Big Blue Sky Shack". He especially enjoys activating parks for the POTA program and blogging about his experiences at HamRadioOutsidetheBox.wordpress.com

Quite recently our local municipality replaced the weather beaten cedar flagpole at one of our local waterfront parks with a brand new one made of steel. During numerous visits to the park to enjoy the beautiful views of the big islands in Georgian Bay (Griffith Is, White Cloud Is and Hay Is), I have often wondered whether the new flagpole would make a good antenna. The flagpole is mounted on a concrete base so it is insulated from the ground. It might make a good vertical element, so I decided to give it a try. But a couple of potential issues had to be addressed before I did that.

First, what is the height of the flagpole? If it is not a half wavelength on any of the bands I usually use I could treat it as a fat random wire antenna. On the other hand, if it is a half wavelength I would need my 49:1 transformer. An eyeball analysis said it might just be a candidate for a half wavelength on 20m so I had to find out.

Second, how could I connect to the flagpole without marking or damaging it? I wanted to be a responsible amateur radio operator and besides, as a municipal taxpayer I figured I had a tiny bit of equity in that municipal asset.



Before making the 30-minute drive up the Georgian Bay side of the lower Bruce Peninsula to get to the park, I had to make sure I had the right gear available. Job One was to devise a means of connecting to the flagpole. Rummaging through my box of bits and pieces revealed a 3-foot length of webbing with a very secure military buckle on one end. The webbing had a grommet installed to secure the buckle. This would be perfect!

Using a quarter-inch nut and bolt and an oversized steel washer for a contact, a short wire was attached with which to connect my 4:1 unun to the flagpole. A 3-foot length of webbing would be sufficient to wrap around a flagpole up to nearly a foot in diameter. I knew from examining the base of the flagpole on a previous visit that its diameter was only maybe 6-inches or so. This bit of kit would do the job nicely.

Below: Connecting the base of the flagpole to the 4:1 unun (black box)

When I arrived on site there was only one other vehicle in the park and a parking space near the flagpole was free, so on to Job Two – determining the height of the flagpole to see whether it is a half wavelength or random height.

I had learned a simple trick for finding the height of an object using nothing more than a stick and a tape measure. It relies on same very basic math, but no calculations are actually required.

Find a stick that is the same length as your arm. I used a trekking pole adjusted to the correct length (yes, yet another cunning use for a trekking pole). Hold the stick vertically at the bottom end and hold it up – at arm's length – in front of the flagpole. Now adjust your position on the ground until the stick appears to be the same height as the flagpole. Now measure the distance between where you are standing and the base of the flagpole.

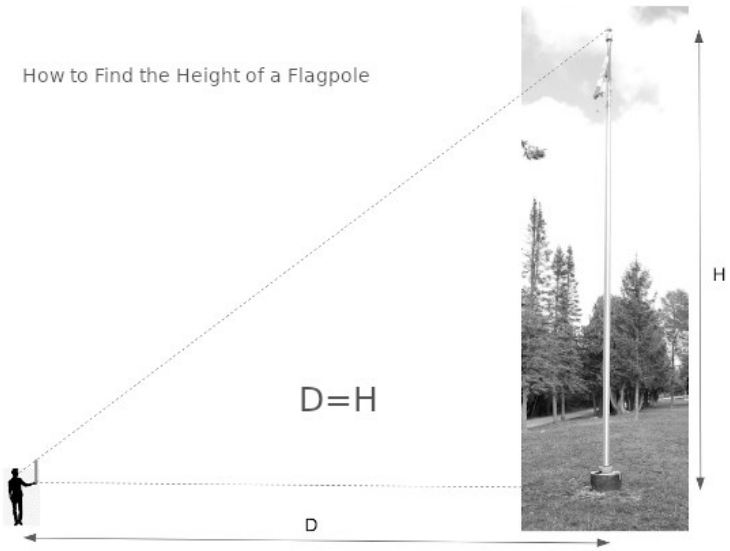
The distance is equal to the height of the flagpole (give or take a few parsecs). Alright, it's not very accurate but the technique does give a very good approximation of the height and that is all that was required for my experiment. My measurement in the park that day showed the flagpole is about 30 feet high. Hmmm, that is close to a half-wave on 20m. I had another trick to try that would confirm my measurement.

Feeling fairly confident, I hooked up my coax and laid out a single 28.5 ft ground radial – the same one I often use with my Rybakov antenna. The Rybakov uses a 28.5ft radiating element supported on a fiberglass pole. The flagpole antenna was very similar to my Rybakov and my LDG Z11 Pro automatic antenna tuner had the correct settings for the Rybakov stored in memory. If the two antennas were significantly different, the tuner would do a complete tuning cycle lasting several seconds. But, if the two antennas were very similar, the tuning cycle would last only a fraction of a second.

This was the "rubber hits the road" moment that would determine whether the day's experiment would be successful. I set the radio to 20 watts CW on the 20m band and keyed up. Bingo, the tuner performed an almost instantaneous tuning cycle and gave me an SWR of 1.1:1. That was a relief. But, always keeping in mind that a dummy load gives a good SWR too, I needed to make a QSO to confirm the successful experiment.

I tuned in to a POTA activator calling CQ. He had a very strong signal and the noise floor out in the Big Blue Sky Shack was very low, making him a good candidate for a test QSO. I jumped in as he signed with a hunter and he heard me. I sent him a 599 report and he gave me a 579. My municipal flagpole antenna was doing fine business!

The park in which I was operating is not a Parks On The Air entity, but it is a very



narrow park alongside a county road that forms part of the Great Lakes Waterfront Trail (VE-6003). Here was an opportunity to do an unplanned activation – a real test of whether my municipal flagpole was a practical antenna.

I posted a self-spot on pota.app from my phone and started calling CQ on 20m. Responses were slow in coming and by the time I had 8 QSOs in the log my battery voltage was showing some low numbers. I knew I had to do something to validate the activation with at least two more QSOs, so I switched to 40m. The flagpole again tuned up super fast and easy with a 1.3:1 SWR. Fortunately I was able to add another 10 QSOs to the log before deciding my battery may not survive much longer, so I called QRT.

And so it was a successful experiment. In all I made 19 QSOs with my municipal flagpole antenna and was very pleased. Now I have my eye on the much taller floodlight towers at the local baseball diamond. Will they tune up on 80m?

~ John VA3KOT

Getting Started on 2m SSB

Try the "Other Mode" on 2 Meters

by BOB WITTE K0NR

Bob Witte K0NR maintains a great blog site at https://www.k0nr.com/wordpress/

In the past decade, a new breed of amateur radio transceiver has hit the marketplace — radios that cover from HF through VHF/UHF frequencies. These radios include the ICOM IC-706, the ICOM IC-7000 the ICOM IC-9100, the Yaesu FT-100 and the Yaesu FT-991. This is not an exhaustive list since there are new radios being introduced every year with additional capability.

These radios include "all-mode capability" which means that they can operate FM, CW and SSB on the VHF bands. Clearly, FM is the most commonly used mode on VHF and UHF but having SSB opens up a whole new range of operating fun.

Why SSB?

FM is the most popular mode primarily due to the wide availability of FM repeaters. These repeaters extend the operating range on VHF and enable low power handheld transceivers to communicate over 100 miles. FM is also used on simplex to make contacts directly without repeaters. The main disadvantage of FM is relatively poor performance when signals are weak, which is where SSB really shines. A weak FM signal can disappear completely

into the noise while a comparable SSB signal is still quite readable. How big of a difference does this really make? Perhaps 10 dB or more, which corresponds to one or two S-units. Put a different way, using SSB instead of FM can be equivalent to having a beam antenna with 10 dB of gain, just by changing modulation types. So this is a big deal and radio amateurs interested in serious VHF work have naturally chosen SSB as the preferred voice mode. (You will also hear them using Morse code or CW transmissions, which is even more efficient that SSB.)

Just as an example of what is possible on SSB, during one VHF contest I was operating portable on Garden of the Gods Road in Colorado Springs. I had just dismantled my 2m yagi antenna and was listening to 2m SSB on a short mobile whip antenna. Suddenly, I heard WA7KYM in Cheyenne, Wyoming calling CQ from about 160 miles away. I figured that with my puny little antenna and only 10 watts of power, there was no way he was going to hear me. But, what the heck, it was a contest and it would be more points so I gave him a call. To my surprise, WA7KYM heard me and we made the contact without much signal strength to spare. Now, to be accurate, this contact has more to do with WA7KYM's "big gun" station (linear amplifier, low noise preamp and large antenna array) than it had to do with my 10 watts and a small whip. The key point here is that this contact would not have happened using FM and was only possible because of SSB.

When and Where to Operate

The SSB portion of the band runs from 144.100 MHz to 144.275 MHz and Upper Sideband (USB) is used. The 2M SSB calling frequency is 144.200 MHz, so that is the first place to look for activity or to call CQ. One of the realities of 2m SSB operation is that many times, no one is on the air. There is just not that much activity out there, compared to 2m FM. Some amateurs get discouraged, turn off the radio and and miss the thrill of working distant stations during a band opening. To get started on 2m SSB, the trick is to get on the air at times when you know there will be activity—during VHF nets and VHF contests.

Here in Colorado, the local Rocky Mountain VHF Plus net is on Monday night at 8:00 PM local time on 144.220 MHz (USB). This net is centered in the Denver area but VHF enthusiasts check in from all around Colorado. It is very common to have stations check in from the bordering states of Wyoming, Nebraska, Kansas, New Mexico or even Oklahoma. More information on the net and other VHF activities can be found at http://www.rmvhf.org

VHF Contests

Think of VHF contests as "VHF activity weekend" since they are a great opportunity to just get on the air and work most of the

Operating portable using 2-meter SSB, with a horizontally polarized Yagi antenna

local 2m SSB enthusiasts. The main contests are the ARRL June VHF Contest, the ARRL January VHF Contest, the ARRL September VHF Contest and the CQ Worldwide VHF Contest in July. For more information, take a look at the article How to Work a VHF Contest.

Equipment

The required equipment for getting started on 2m SSB is pretty basic – a transceiver capable of 2m SSB and a 2m antenna. If you own one of the rigs mentioned above then you are probably ready to go. The 2m antenna you already have is probably vertically polarized since that is what we use for 2m FM, both mobile and base stations. All of the 1/4-wave and 5/8-wave antennas that are commonly used for 2m mobile work are vertically polarized. Most omni-directional base station antennas such as those made by Cushcraft, Diamond, Comet, etc. are vertical, too. These antennas will work for SSB but most of the really active 2m SSB stations use horizontally-polarized antennas. Vertically-polarized stations can work horizontally-polarized stations but there will be a substantial signal loss (about 20dB?). If vertical is all you have, then give it a try. If you can get a horizontal antenna, then your results will be much better.

The most common horizontally-polarized antenna on 2m is a Yagi mounted so that its elements are parallel to the ground. There are a variety of horizontally-polarized, omni-directional mobile antennas, such as the HO antenna made by M2 (see http://www.m2inc.com).

Get on the Air

This information is intended to get your started on your way to operating 2m on the SSB portion of the band. You will learn more as you get into it and you will find that most of the people hanging out down on sideband are friendly, knowledgeable and helpful. They are always happy to see new call signs on the band.

Some resources available on the web are:

- Rocky Mountain VHF Plus web page: http://www.rmvhf.org
- VHF Operating articles by KØNR (similar to this one) at: http://www.k0nr.com/
- North East Weak Signal Group web site at: http://www.newsvhf.com/
- Single Sideband on 2 Meters: The Other VHF Mode (hamradioschool.com)

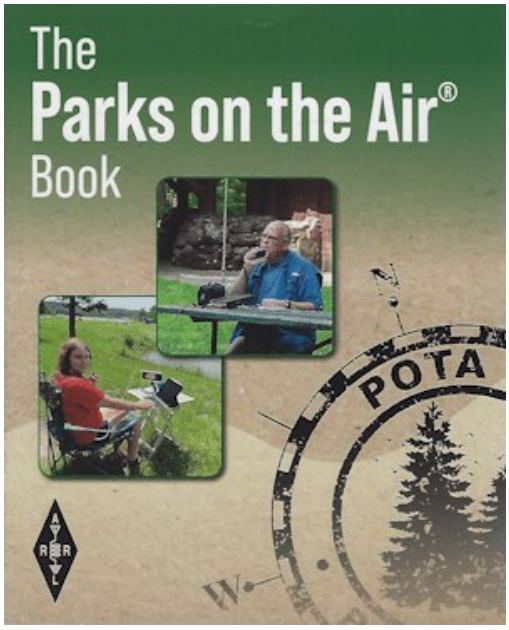
~ *Bob KØNR*

Check out Bob's book

VHF, Summits and More: Having Fun With Ham Radio.

This book is an easy-to-understand introduction to VHF/UHF ham radio, including practical tips for getting on the air and having fun messing around with radios. Learn about FM, SSB, repeaters, equipment, band plans, phonetics, portable operating, Summits On The Air (SOTA) activations and more.

I was happy to contribute an article to the recent ARRL Parks On The Air (POTA) book. This piece is based on my Pikes Peak mountain topping article that appeared in the June 2023 issue of QST. This book is a collection of articles about POTA from 14 different authors, each writing about a different aspect of the program. The articles are all easy to read and generally provide a first-hand account of how the author has experienced POTA operating. There is plenty of beginner information and operating tips sprinkled throughout the book. More experienced POTA enthusiasts will probably pick up a few new ideas as well.



The Table of Contents lists the articles and authors, giving you a good idea of the material covered. The meat of the book is only 118 pages long and it is quite easy to read.

My piece covered the triple activation I did from the summit of Pikes Peak, combining POTA, SOTA, and the June VHF Contest into one mountaintop adventure. For POTA, the park was the Pike National Forest (K-4404). I've done this type of combo activation in the past, sometimes just SOTA + POTA or just SOTA + VHF Contest. This time I did all three.

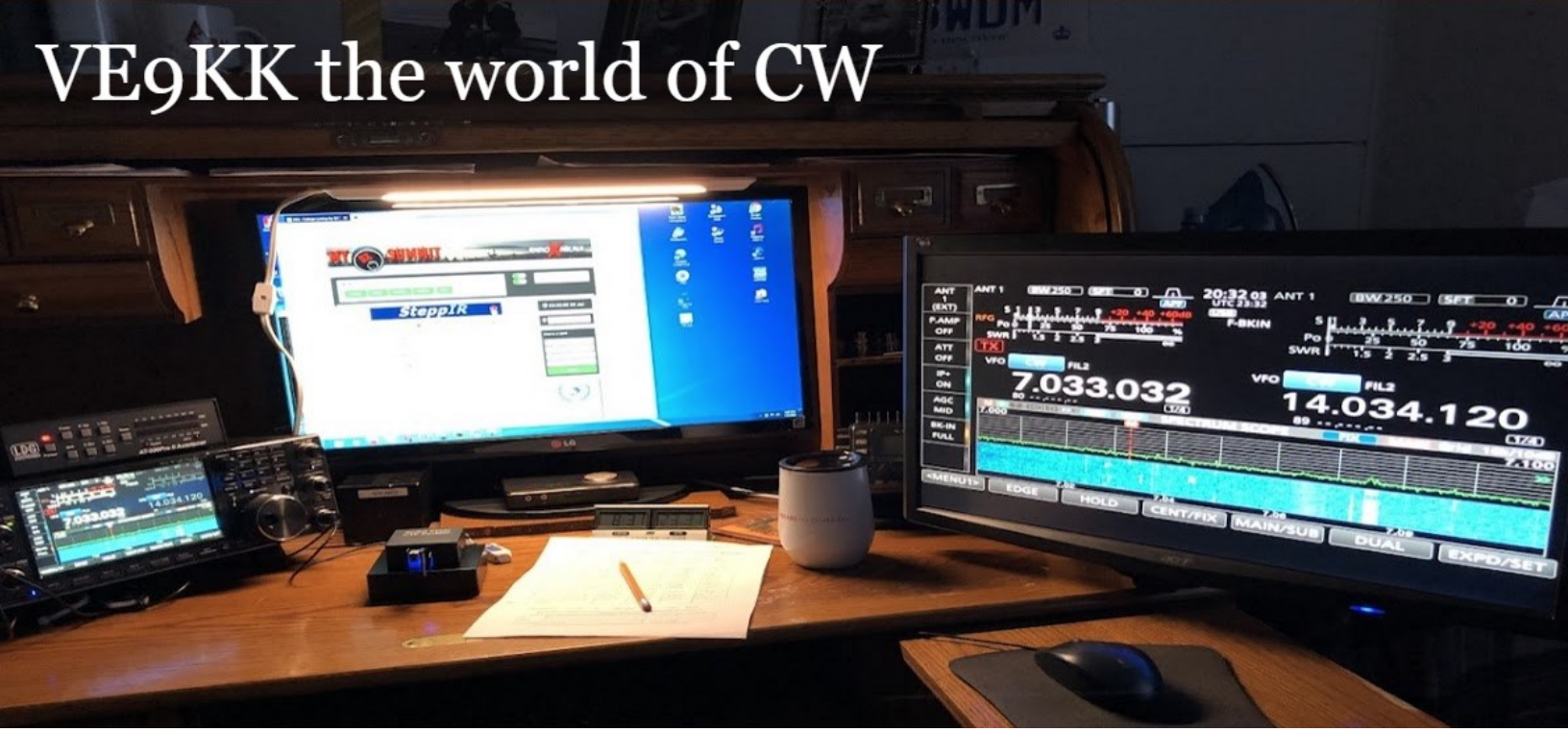
~ *Bob K0NR*

I found your site following a path from https://archive.org/details/dlarc and am impressed. My interest was aroused since my QTH is on Surrey Avenue which is serviced by an Ontario [California] post office. It must be Karma, or a big coincidence.

Please add me to your mailing list for "The Communicator" starting with the January / February 2024 issue since I have downloaded the November / December issue. I shall probably throw a few USDs which PayPal should be able to convert to Loonies. Or perhaps join for the thrill of it.

73,

Ed Bode NO6ED



The ARRL10m contest

has come and gone

by MIKE WEIR VE9KK

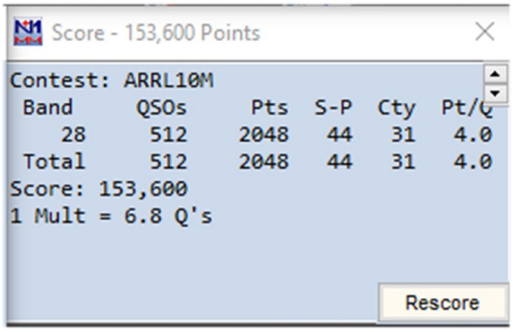
Mike Weir VE9KK was first licensed in 1989 and upgraded to advanced in 2000. He primarily operates contests both CW and RTTY.
His blog is at: VE9KK the world of CW

This past weekend was the running of the ARRL 10m contest for both CW and SSB. We are in a very nice time in the solar cycle which makes the 10m contest a popular one. The weekend solar conditions were great with the Kp index floating between Kp0 and Kp1. With good solar weather meaning an active sun also comes solar storms with very high Kp index and poor conditions but this weekend was great. As always here at VE9KK I was CW only entry in the contest. Compared to last year's contest I noticed the window into Europe in the mornings did not last that long this year. I did notice more of a window opened in the afternoon toward South America.

I heard no what might be called exotic DX at my end and most of my scoring was contacting U.S. stations. Due to the propagation of 10m here, I was on the radio at about 7 am local time and off at 5 pm. I found that after 5 pm signals were just not reliable, with many repeats and then the station would just fall off the face of the spectrum. I had a few stations contact me from the Netherlands including Bas PE4BAS a fellow blogger. We did talk a week before the contest about trying to touch base in the contest but you never know.

I have a program called log analyzer in which you load your contest log in ADIF format (other formats are supported). The program gives you a world map of all your contacts, there are many options the program offers. I do find that if a station you contacted in the contest has an incorrect grid square then you may see an odd country you contacted. For me, the contest showed a U.S. station that was in Saudi Arabia. It was due to his incorrect grid square but that only happens very seldom.

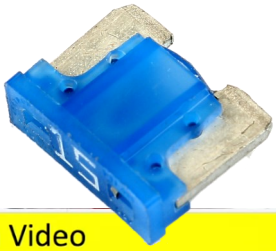
In this contest my best 1 hour of running was 100 contacts but most of the time it averaged in around 45-70. I did very little searching and pouncing or S&P as it is called. I enter the contest as unassisted meaning I do not use any spotting software. I do this as it gives me more of a challenge. If I entered the assisted category I would have call signs listed on the waterfall of N1MM+ contest software. I could mouse-click from one call to the next and bang off contacts and points. Also, I could see multipliers as well this way. As for me I have fun unassisted and call CQ contest and S&P the waterfall. Below are the results of this year's ARRL 10m contest.


Score - 153,600 Points
Contest: ARRL10M
Band QSOs Pts S-P Cty Pt/Q
28 512 2048 44 31 4.0
Total 512 2048 44 31 4.0
Score: 153,600
1 Mult = 6.8 Q's
Rescore

Oh and before I go I did have Murphy visit me during this contest or maybe it was just plain old age. I all of a sudden lost mouse control. No matter what I did there was no movement. I ended up restarting my PC which during a contest is a major deal. Once restarted my old age moment passed and I realized I had mouse control again. It was due to the fact I was using the mouse on the left of my desk before the restart and that is the mouse for my Linux PC!!! On the right side of my desk is my Windows mouse and I did not even realize I was using my left-hand side mouse. No restart was needed in the end after all.

~ Mike VE7KK

Another look at blade fuses



Last month we ran a story about testing automotive type blade fuses that many of us use in our expensive amateur radio gear. It showed a wide gap between name brands (ie: Littlefuse and Bussman) and cheap Chinese import fuses. In several instances tests showed that a 5-Amp rated import fuse did not blow even at 20 amps.

Fuse Comparison Video

	milli-ohm Resistance Measurements					
Fuse Size	Ebay	Bussman	Bussman	Littlefuse	Littlefuse	Recalled Harbor
Amps	Junk Fuses	Fuses	Specification*	Fuses	Specification	Freight Fuses
5	2.02	16.49	16.66	17.63	17.75	1.31
10	2.03	7.49	7.85	7.24	7.42	1.31
15	3.14	4.85	4.89	4.76	4.58	1.31
20	1.18	3.43	3.49	3.54	3.21	1.0
25	1.03	2.49	2.56	2.59	2.36	0.95
30	1.05	2.04	2.09	2.02	1.85	0.97
			* Bussman allows 4% tolerance			

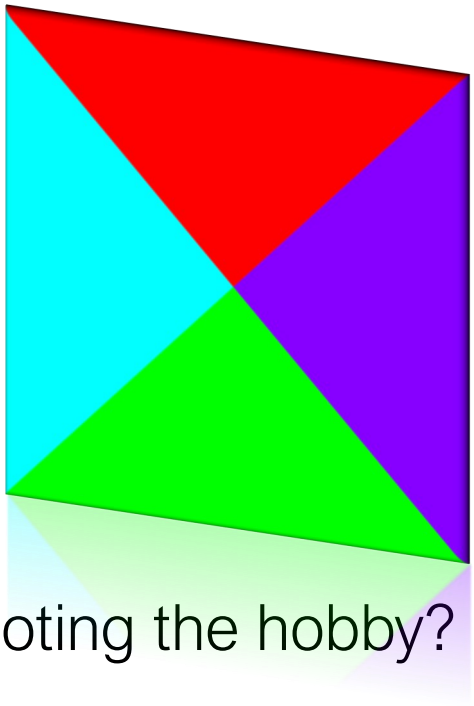
The YouTube video recommended last month is at: https://www.youtube.com/watch?v=apQU_VuJIFU

This month another YouTube video surfaced and its findings back-up the other video but the experiment is more detailed, especially after the 20-minute mark. It is titled “Automotive Fuses - Does the brand really matter?” See: https://www.youtube.com/watch?v=nELwmfAOz_I

As a reference, the chart above show what the resistance of a new fuse should be.

~

Foundations of Amateur Radio



What about promoting the hobby?

by ONNO BENSCHOP VK6FLAB

Onno Benschop
VK6FLAB
To listen to the podcast, visit the website: http://podcasts.vk6flab.com/. You can also use your podcast tool of choice and search for my callsign, VK6FLAB.

Full instructions on how to listen are here: https://podcasts.vk6flab.com/about/help

Amateur radio is an activity enjoyed by many people around the world. How many exactly is cause for debate. The most recent official figure we have is from the IARU, the International Amateur Radio Union. In 2020 it counted over 3 million people, but an article written a year later puts that figure at 1.75 million.

In Australia there's a common narrative that the total amateur population is in undeniable decline, some think that it's on a stark decline. Interested in hard data, for years I've been collecting information around the amateur population in Australia and I can report that across the nine years that I have data for the total variation is within two percent and it's not a straight line down either. There was a dip in 2020, potentially associated with training and callsign allocation being moved from the Wireless Institute of Australia to the Australian Maritime College, something which is going to change again shortly when amateur licensing in Australia will revert to the regulator, the Australian Communications and Media Authority. If you're familiar with amateur licensing in Australia, that's not the only change, but that's not what I'm looking at today, mainly because the available information associated with the upcoming changes are limited at best, seemingly buried in invective at worst.

Back to the topic at hand. One of the often heard responses in relation to the decline of our hobby is recruitment of new amateurs. It's a topic that I've spent plenty of time over the past decade contemplating. How do you share

the joy of amateur radio with a general public who is apathetic to the preconceived ideas associated with this hobby, you know, old white men sitting in the dark with Morse keys.

For the record, I prefer a shack with light and I still don't know how to use a Morse key, other than to make my radio beep. The rest is genetic.

In the quest for spreading the word there's a repeated emphasis on the young, often coalescing around the annual Jamboree on the Air, or JOTA, as organised between Scouting groups and radio amateurs. I have previously said that JOTA was how I first came across amateur radio, but at the time, aged 15 or so, I had no money for such endeavours and the experience didn't resonate with me until decades later. So, you could argue that this is what changed me into an amateur, but the reality is that I had to come across the hobby a few more times before I got interested enough to investigate, something which I have spoken about before, in short, Meg, then VK6LUX introduced me to the concept of controlling a 2.4 GHz drone using higher power than was permitted with standard Wi-Fi equipment. I was hooked and got my license less than a month later. I then discovered that I needed more permissions and set about studying, only to get distracted with everything I could already do. I'm still being distracted today.

So, JOTA is a potential touch point, but I see little evidence that the initial spark goes anywhere in a hurry. I'm not dismissing it as a way to have amateur radio gain relevance outside our own community, but perhaps there are other ways to make this happen. In the early days of my journey I attended country fairs with my club and we'd set-up a radio or six to show and tell. There was talk of doing this in a shopping centre, at the local hardware store and even brief discussions about doing this at the local electronics store. As enjoyable as this was, none of it ever appeared to generate any permanent interest and I don't recall seeing new amateurs suddenly appear at the club after any outings.

Last week Glynn VK6PAW and I, set-up at the local airport, YPPH, that's Perth International Airport if you're not familiar with the designation allocated by the United Nations arm, ICAO or the International Civil Aviation Organization. Perth has a public viewing area. It's situated at the south western end of runway 03/21. It's an elevated position with minimal shade, some seating and you're 320 m from the runway centreline. It's a place where plane spotters congregate and now a few radio amateurs.

One thing we have in common is an interest in radio. We were told that the plane spotters often listen to one or two frequencies and if they're into video, they might record one radio channel to include on their YouTube videos. When Glynn and I visited we had a few radios with us. When I say few, in amateur terms we only had about five or so, but I suppose that comes with the territory. As it happens, admittedly not by accident, our

All podcast transcripts are collated and edited in an annual volume which you can find by searching for my callsign on your local Amazon store, or visit my author page: http://amazon.com/author/owh. Volume 7 is out now.

Feel free to get in touch directly via email: cq@vk6flab.com, follow on twitter: @vk6flab or check the website for more: http://vk6flab.com/

If you'd like to join a weekly net for new and returning amateurs, check out the details at http://ftroop.vk6flab.com/, the net runs every week on Saturday, from 00:00 to 01:00 UTC on Echolink, IRLP, AllStar Link, IRN and 2m/70cm FM via various repeaters.

If you'd like to participate in discussion about the podcast or about amateur radio, you can visit the Facebook group: https://www.facebook.com/groups/foundations.itmaze

This podcast episode was produced by Onno (VK6FLAB). You can find more at http://vk6flab.com/

radios could receive airband frequencies, so we could tune to Perth Tower, Perth Arrival, Perth Ground, Perth Departure and Melbourne Central, all at the same time. Next time we'll likely bring some HF gear so we can also listen to HF aviation frequencies as well.

While I was hosting F-troop, the weekly net for new and returning amateurs, midnight UTC, every Saturday morning for an hour, Glynn was busy talking and sharing with the plane spotting community. There were conversations around what radios and antennas to use, how you could tune to more than one frequency at the same time, how you could use software defined radios, how to set-up radios so you could have different channels appear at the left or the right, in the middle, or somewhere in between, which will allow you to focus on a particular radio call as it happens. Also, I should mention a piece of software called rtl-airband which allows you to use an RTL-SDR dongle to do this at home, but I digress.

There was a steady stream of people looking at planes and their age was surprising, aged 3 to 93 or so. Of course not all were into the radio, but plenty were.

Afterwards it occurred to us that there might be other venues like this, attracting people who are interested in radio for their own purposes. I have no doubt that we'll be back to Perth Airport, but I suspect we'll also see if we can find some other spotters. Train, ship and other airports come to mind immediately. I can't wait to learn about other people's uses and interests in radio, even if radio isn't the main attraction in their hobby. Perhaps you can think of some that you'd like to share.

Getting on air and making noise is one way to get outside, but publicly listening to frequencies that others are interested in is a perfect excuse to play with radios.

~ I'm Onno VK6FLAB

KB6NU'S HAM RADIO

Will AI help us have more fun with amateur radio?

"HAL, let's work 20-meter FT8 this afternoon."

by DAN ROMANCHIK KB6NU

Dan Romanchik KB6NU blogs about amateur radio at KB6NU.com when he's not trying to figure out which way current flows. Dan teaches ham radio classes, and operates CW on the HF bands. Look for him on 30m, 40m, and 80m. You can email him at cwgeek@kb6nu.com

In this morning's email was a message from Inc. magazine with links to some articles in the magazine. At the top of the list was, "4 Unimaginable Ways A.I. Will Change Your Life Within the Next 5 Years, According to Bill Gates." Gates says that in the next five years, you will have your own artificial intelligence assistant, or agent, that will be a frequent voice in your ear and will help you with everything from deciding where to go on vacation to managing your friendships and more. Let's think for a minute about Gates' 4 Ways and how they might help us enjoy amateur radio more.

1. You won't bother with software or operating systems anymore.

How cool would this be. You could simply tell your AI amateur radio assistant, "Let's operate 20-meter FT8 this afternoon," and the agent would set up the radio and begin looking for contacts. If the

band wasn't open, it would come back and tell you, "I'm sorry, Dave, but propagation on 20 meters is terrible this afternoon. May I suggest 30 meters instead?"

2. Your agent will be a frequent voice in your ear.

Gates believes that most of us will wear at least one earbud most of the time so that our agents can talk to us whenever they need to. So, for example, it might be monitoring the activity on 6 meters and notify you when the band is open. Or, you might want it to notify you when a particular contest or operating event is coming up so that you don't miss it. "Dave," it might say, "remember that the 2-meter club net is at 8 pm tonight."

3. Your agent will get involved in your personal relationships.

We often don't think of amateur radio as having a personal aspect, but it really does. For example, don't we enjoy talking to some people more than others? Your personal agent could monitor your club's 2-meter repeater or 40-meter CW and notify you when your friends are on the air.

Gates also notes that you could have your AI assistant talk to your friends' assistants and set up lunch for you. Well, you could also use that capability to set up an on-air sked.

4. It might even help you solve personal problems.

The article notes, "One of the most intriguing predictions Gates made is that your agent could also become your therapist" While many hams probably do need therapy, I'm not so sure how applicable this will be to amateur radio.

What I could see happening is using an AI assistant to help you choose your next rig or maybe help you troubleshoot a problem. Here are some scenarios:

1. You ask your AI assistant what rig you should buy next. Since it already knows what bands you like to operate—and the state of your finances—it can analyze all the options and find a radio that meets your operating needs and fits into your budget.
2. You might describe your backyard and the bands that you want to operate, and your AI Assistant could come back with antenna suggestions.
3. You ask your AI assistant about a problem that you're having with your rig. It comes back with, "Dave, if you would just RTFM, you will find the answer on page 67 of the operating manual." Or, after scanning the appropriate online forums, it would tell you, "Dave, several other owners seem to be having a similar problem. Here's what they've done…."

All of this sounds kind of fun to me, but I can understand some of you having reservations. What do you think? Can you think of other ways an AI assistant would make amateur radio more fun for you?

~ Dan KB6NU

No-Ham Recipes

by GAIL O'CONNOR VE7ARO

Spicy mock chicken wings

Says Gail, "l had to make an entrée for a gathering in midsummer and was told it should be something that could be eaten hot or cold since arrivals of other guests were scattered thru' the hour. This recipe serves well and tastes well either hot or cold."

- 12 boneless, skinless chicken thighs
- 2 tablespoons (30 ml) light soy sauce
- 2 tablespoons (30 ml) honey
- 2 tablespoons (30 ml) freshly squeezed lemon or lime juice
- 1 teaspoon (5 ml) chili powder 4 to 5 dashes hot pepper sauce
- 1/3 cup (90 ml) barbeque sauce
- 2 tablespoons (30 ml) Dijon mustard
- 2 teaspoons (10 ml) minced garlic
- 1 teaspoon (5 ml) corn starch

Preheat oven to 400F (200C or a moderately hot oven)

Spray a 9 x13 inch (22.9 x 33 cm) baking pan with non-stick cooking spray and set aside. Trim fat from chicken thighs and place them in a single layer in the baking pan. Fold or roll them so they resemble chicken wings.

Whisk barbeque sauce, soy sauce, mustard, honey, lemon or lime juice, garlic, chili powder and hot sauce in small bowl. Spoon sauce mixture evenly over chicken pieces, reserving some for later use as a dipping sauce.

Bake chicken uncovered, for 35 to 40 minutes, until it is well cooked all the way through and sauce is bubbly. Arrange chicken on serving platter and keep warm.

While chicken is baking, combine corn starch with 2 teaspoons (10 ml) cold water and mix until smooth. Stir corn starch into sauce mixture you reserved, Bring to a boil, whisking until mixture has thickened. Serve as extra dipping sauce.

~

Back to Basics

From The Canadian Basic Question Bank

About Coaxial Cable

John Schouten VE7TI has been teaching amateur radio courses for over 20 years, and is the Course Coordinator for Surrey Amateur Radio Communications

In the realm of modern communication systems, antennas serve as the vital link between devices and the electromagnetic spectrum. However, to ensure efficient signal transfer and minimize losses, the use of suitable transmission media becomes crucial. One medium that is prominent is the 50-Ohm coaxial cable. In this 'Back to Basic', we will delve into the key characteristics and advantages of 50-Ohm coaxial cable for antenna feedlline, exploring how it serves its purpose.

There are several questions on the subject in the Canadian Basic Question Bank and in similar documents internationally. For example:

B-6-1-4 The characteristic impedance of a coaxial line:

A. can be the same for different diameter line

B. changes significantly with the frequency of the energy it carries

C. is correct for only one size of line

D. is greater for larger diameter line

And

B-6-2-6 What is an unbalanced line?

A. Transmission line with both conductors connected to each other

B. Transmission line with one conductor connected to ground

C. Transmission line with neither conductor connected to ground

D. Transmission line with both conductors connected to ground

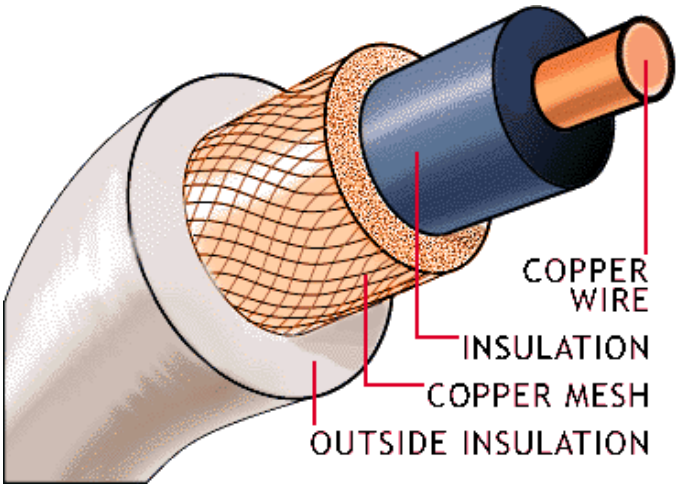
At its core, a coaxial cable consists of two concentric conductors separated by a dielectric material. The center conductor, typically made of copper or copper-plated steel, carries the signal, while the outer conductor serves as a shield, protecting the inner conductor from external

interference. The 50-Ohm impedance, a measure of electrical resistance, is a fundamental parameter that positively influences the cable's ability to deliver signals efficiently.

Impedance and length

Impedance in coaxial cable remains the same regardless of length because of the way the cable is designed. The cable has a specific structure with an inner conductor, a surrounding insulating material called the dielectric, and an outer conductor. The dimensions and characteristics of these components are carefully chosen to create a specific impedance for the cable. Impedance is like a measure of resistance to the flow of electrical signals. When a signal travels through the coaxial cable, it encounters the same structure and materials along its entire length. This consistent structure ensures that the electric and magnetic fields of the signal are balanced, resulting in the same impedance throughout.

So, no matter how long the coaxial cable is, as long as there are no changes or damages to the cable, the impedance will stay the same. This is important because it allows for efficient transmission of signals without any reflections or distortions, especially for high-frequency or broadband signals.



About 'Skin-effect'

In RF transmission, the skin effect is when high-frequency signals tend to flow more on the outer surface of a conductor rather than evenly throughout its entire cross-section.

Imagine you have a wire like a straw. When you pour a liquid inside the straw, it flows evenly throughout the entire space within the straw. However, with RF signals, it's like pouring something sticky inside the straw. As the frequency increases, the signal starts to stick more to the outer surface of the wire, similar to how sticky liquid would stick to the inside walls of the straw.

This happens because the alternating magnetic field created by the high-frequency current induces additional currents, called eddy currents, within the wire. These eddy currents create their own magnetic fields that oppose the original field. This opposition makes the current prefer to flow on the outer part of the wire to reduce the interaction with the magnetic field and minimize the opposition.

As a result, the effective flow of current becomes smaller as you go deeper into the wire, concentrating more on the outer surface. This effect increases the resistance of the wire to the RF signal. It's like a highway with several lanes, but as the traffic increases, most cars start to use only the outer lanes.

The skin effect has consequences in RF transmission because it leads to additional resistance and power loss. It can limit the amount of RF energy that can be transmitted efficiently through a conductor. To minimize this effect, conductors used in RF applications are often designed with larger diameters or multiple smaller strands to increase the surface area and allow for better signal distribution throughout the wire.

Velocity factor and propagation delay

Velocity factor *(VF)* and propagation delay in a transmission line are related, but they are not the same thing.

The velocity factor is a measure of the speed at which an electrical signal travels along the transmission line, compared to the speed of light in a vacuum. It's a dimensionless quantity, often expressed as a percentage or a decimal fraction.

For example, if a signal travels at half the speed of light along a particular transmission line, the velocity factor would be 0.5 or 50%. The velocity factor depends on the physical properties of the transmission line, particularly its inductance and capacitance. In practical terms, a higher velocity factor means that the signal will reach the end of the line more quickly. It's an important factor to consider in high-speed data transmission and radio frequency applications.

On the other hand, propagation delay is the time it takes for a signal to travel from one end of the transmission line to the other. It's usually measured in seconds (or fractions thereof), and it depends on both the physical length of the line and the velocity factor.

In other words, the propagation delay is determined by how fast the signal can travel (the velocity factor) and how far it has to go (the length of the line). So while the two concepts are closely related, they represent different aspects of signal transmission.

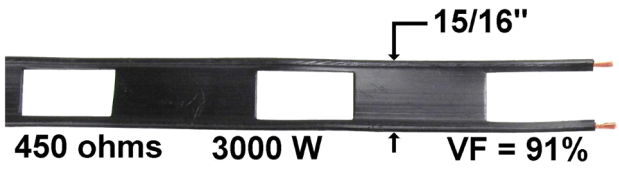
When a signal is applied to one end of the coaxial cable, it travels along the inner conductor at a specific speed, which is typically close to the speed of light. However, the signal encounters some impedance and resistance within the cable, causing it to take a certain amount of time to reach the other end.

This delay is usually very small, often measured in nanoseconds or microseconds, but it can become significant in certain applications that require precise timing or when dealing with long cable lengths. Propagation delay can affect the overall performance of a communication system, especially in situations where multiple signals are transmitted simultaneously or when high-speed data transmission is involved.

'Unbalanced'

Coaxial cable is referred to as an unbalanced transmission line. Why is that? It is because its structure involves an inner

A balanced line is a type of transmission line where the voltages and currents are equal in magnitude and opposite in polarity with respect to a reference point. It is designed to minimize signal distortion and interference by providing symmetrical impedance to the transmitted signal. This helps in reducing noise and improving signal quality. In contrast to coaxial cable, it cannot be buried or run along metallic surfaces.



conductor surrounded by a concentric outer conductor, with both conductors sharing the same axis. The inner conductor carries the signal, while the outer conductor serves as the return path. However, the signal on the inner conductor is not balanced or symmetrical with respect to ground or the outer conductor. This imbalance occurs because the voltage and current on the inner conductor are referenced to ground or the outer conductor, creating an unbalanced transmission system. This is in contrast to a 'balanced' transmission line shown above.

One primary advantage of using a 50-Ohm coaxial cable for antennas is its compatibility with a wide range of radio frequency (RF) applications. This impedance value matches the characteristic impedance of many transmission lines, connectors, and antennas. As a result, it facilitates seamless signal transfer, minimizing reflections and impedance mismatch issues that could degrade signal quality.

Loss

Low loss is another essential characteristic of 50-Ohm coaxial cable. The dielectric material between the conductors plays a crucial role in minimizing signal attenuation. Coaxial cables with low loss ensure that most of the signal reaches its intended destination without significant degradation. This is especially important for long-distance transmission and high-frequency applications where signal losses must be kept to a minimum.

Furthermore, the construction of 50-Ohm coaxial cable provides excellent shielding properties. The outer conductor, often in the form of single or double braided shielding, a metallic foil, or both, offers protection against external electromagnetic interference (EMI) and radio frequency interference (RFI). By minimizing the impact of external noise, the cable helps maintain signal integrity and enhances overall antenna performance.

In terms of practicality, the 50-Ohm coaxial cable offers notable flexibility and ease of installation. Depending on its thickness and construction, its design allows for excellent bend radius, making it suitable for various installations, including tight spaces and corners. Additionally, the availability of connectors specifically designed for 50-Ohm coaxial cable simplifies the process of connecting antennas and other equipment, facilitating convenient setup and maintenance.

It is important to note that the choice of coaxial cable impedance depends on the specific application. In certain cases, such as television, other impedance values like 75 Ohms are the standard. However, when it comes to amateur radio, commercial radio, and broadcast antennas, the 50-Ohm coaxial cable has become the de facto standard.

Let's look at the correct answers to our earlier questions:

B-6-1-4 The characteristic impedance of a coaxial line:

A. can be the same for different diameter line

Explanation: The Characteristic Impedance of coaxial cable is determined by the ratio of the outer conductor to the inner conductor. Different diameters of lines can have the same Characteristic Impedance as long as the RATIO is preserved.

And,

B-6-2-6 What is an unbalanced line?

B. Transmission line with one conductor connected to ground

Explanation: key word: UNBALANCED. An 'UNbalanced' transmission line functions with one conductor connected to ground (like coaxial cable or 'coax' for short). A 'balanced' transmission line operates with both conductors floating above ground potential (like all types of parallel lines such as twin-lead or open-wire line).

~ John VE7TI

Calling all New Amateurs:
Get your Name in Lights!

Did you get your Amateur Radio certficate within the past year or two and want to introduce yourself through TCA to the Amateur Radio community? If so we would love to hear from you.

Drop a line to tcamag@yahoo.ca and tell us how you were introduced to the magic of Amateur Radio.

Do you credit any particular Amateur ("Elmer") with getting you started? Which aspect of the hobby do you enjoy so far?

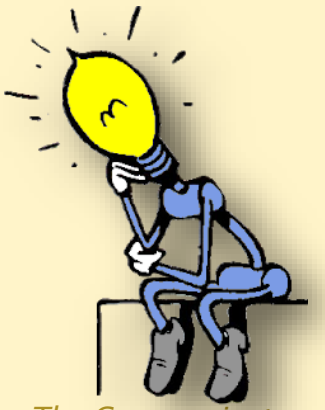
Please be sure to include your name, call sign, date and level of certificate – and don't forget to include a photo or two. We hope to hear from you soon!

Those pesky block diagrams

More information needed? Click: https://bit.ly/SARCcourses

Our new students are often confused by the block diagrams for receivers and transmitters that are part of the Canadian Basic Amateur Radio Question Bank, and it is frequently mentioned in our course feedback as one of the more challenging lessons. As we have previously mentioned, there is a freeware program to practice assembling block diagrams called 'Ham Puzzle available as a free Windows download from Radio Amateurs of Canada at: https://www.rac.ca/wp-content/uploads/2014/04/HAMpuzzle/HAMpuzzle12.zip. It can also run under Wine on a Mac.

Even with Ham Puzzle our students continue to look for a better way to commit these block diagrams to memory. If you, or your club, are involved in instruction and you have a memory aid, we'd love to pass it on to our students.



~ John VE7TI
VE7TI@myrac.ca

Spring course in April

SURREY AMATEUR RADIO

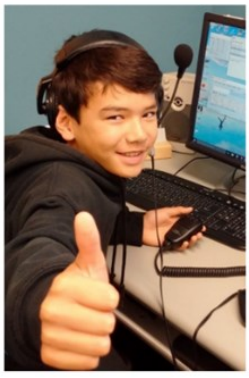
basiccourse

OBTAIN YOUR FEDERAL AMATEUR RADIO CERTIFICATE

7-WEEKS · ON-LINE · $80

Next course starts Monday, January 15 — contact sarc@ve7sar.net

Includes classes, a comprehensive manual, videos and the exam fee



- Ideal for outdoors activities. Long range communications anywhere for free without commercial infrastructure
- Enhance your personal and your community's preparedness in an emergency
- Use satellite communication to speak around the world, perhaps even to an astronaut
- Use a radio, computer, smartphone or tablet for free worldwide voice and digital communications
- Participate in 'Radio Sports' like Contesting and Hidden Transmitter Hunts
- Practice an exciting hobby or start a career opportunity

City of Surrey
separ
Surrey Emergency Program Amateur Radio

https://separ.ca/

Our Radio Courses

SARC
Surrey Amateur Radio Communications

http://ve7sar.net

British Columbia QSO Party 2024

1600z Feb 3 to 0359z Feb 4 AND Feb 4 1600z to 2359z Feb 4

Objectives:

- **Stations in British Columbia contact other stations in the province as well as the rest of Canada, the United States and beyond.**
- **Stations outside British Columbia make contacts with VE7/VA7 stations.**

- Original photo certificates for top scores in all classes of entry, BC and outside BC (state/province/DX). New photo every year! Collectible!
- Special photo certificates for top score in each federal electoral district in BC. (BC stations only)
- Plaques offered in **10** sponsored categories: Top YL, Top BC single-op, Top BC multi-op, Top US, Top Canada outside BC, Top DX, Top Mixed Mode, Top CW, Most Federal Districts Contacted and Top Club in BC
- BCQP is fully supported by N1MM contest logging software, CQ/X GPS-enabled software for mobile contesting and N3FJP state QSO party logging program.
- Follow links at **http://orcadxcc.org/bcqp.html** for rules, tools, helpful hints, and in-depth event analysis/reports and scores from past years.
- BCQP is included in the State QSO Party Challenge.
  - Enter competition by posting BCQP score to 3830scores.com

Questions?
Email BCQP Contest Coordinator, Rebecca VA7BEC at va7bec@gmail.com

Join Orca DXCC in BCQP 2024
It's always a whale of a good time!

BCQP home page: http://orcadxcc.org/bcqp.html Rules: http://orcadxcc.org/bcqp_rules.html
Multipliers: http://orcadxcc.org/bcqp_districts.html
BCQP 2024 Weekend Schedule (showing other events that overlap with BCQP)
http://orcadxcc.org/content/pdf/2024_sked.pdf

JANUARY 2024

	MON	TUE	WED	THU	FRI	SAT
	Jan 1 Look for the new SARC Communicator New Year's Day	2 Day After New Year's Day (Quebec) 19:30 SEPAR Net 20:00 SARC Weekly Net	3	4 20:00 GOTA Net	5	6 Contest: ARRL RTTY RU Epiphany 07:30 Weekly Breakfast Meet [Denny's] 09:30 OTC Activation
7 Contest: ARRL RTTY RU	8	9 19:30 SEPAR Net 20:00 SARC Weekly Net	10 19:00 SARC Monthly Meeting	11 20:00 GOTA Net	12	13 Contest: NA QSO Party (CW) 07:30 Weekly Breakfast Meet [Denny's] 08:30 GOTA Workshop 09:30 OTC Activation
14 Contest: NA QSO Party (CW)	15	16 19:30 SEPAR Net 20:00 SARC Weekly Net	17	18 20:00 GOTA Net	19	20 Contest: NA QSO Party (SSB) ARRL VHF Contest 07:30 Weekly Breakfast Meet [Denny's] 09:30 OTC Activation
21 Contest: NA QSO Party (SSB) 12:30 ARRL VHF Contest	22	23 12:30 ARRL VHF Contest 19:30 SEPAR Net 20:00 SARC Weekly Net	24 SARC Exec meeting changed to Jan 31	25 20:00 GOTA Net	26	27 07:30 Weekly Breakfast Meet [Denny's] 09:30 OTC Activation
28	29	30 19:30 SEPAR Net 20:00 SARC Weekly Net	31 19:00 SARC Exec Meeting	Feb 1 20:00 GOTA Net		

FEBRUARY 2024

					FRI	SAT
					2 Groundhog Day	3 Contest: BC QSO Party (CW, SSB) 07:30 Weekly Breakfast Meet [Denny's] 09:30 OTC Activation
4 Contest: BC QSO Party (CW, SSB)	5	6 19:30 SEPAR Net 20:00 SARC Weekly Net	7	8 20:00 GOTA Net	9	10 Contest: CQ WPX Contest (RTTY) 07:30 Weekly Breakfast Meet [Denny's] 09:30 OTC Activation
11 Contest: CQ WPX Contest (RTTY)	12	13 19:30 SEPAR Net 20:00 SARC Weekly Net	14 Valentine's Day SARC Meeting moved to Feb 21	15 20:00 GOTA Net	16	17 Contest: ARRL International DX Contest 07:30 Weekly Breakfast Meet [Denny's] 09:30 OTC Activation
18 Contest: ARRL International DX Contest	19 Family Day (regional holiday) Islander Day (Prince Edward Island) Louis Riel Day (Manitoba) Nova Scotia Heritage Day (Nova Scotia)	20 19:30 SEPAR Net 20:00 SARC Weekly Net	21 19:00 SARC Monthly Meeting	22 20:00 GOTA Net	23 Yukon Heritage Day (Yukon)	24 Contest: NA QSO Party (RTTY) 07:30 Weekly Breakfast Meet [Denny's] 09:30 OTC Activation
25 Contest: NA QSO Party (RTTY)	26	27 19:30 SEPAR Net 20:00 SARC Weekly Net	28 19:00 SARC Exec Meeting	29 20:00 GOTA Net	Mar 1 Look for the new SARC Communicator	2 07:30 Weekly Breakfast Meet [Denny's] 09:30 OTC Activation

Event details: SARC—SEPAR 'Live' calendar link All contest information: WA7BNM Contest Calendar: Home

Radio-Active

Profiles of SARC members

Meet Lesley Verhulst VE7CMI

Coordinated by LARRY BLOOM VE7LXB

Lesley Verhulst was born and raised in Maple Ridge and is the youngest of 4 children. Lesley has lived in Maple Ridge her whole life except for the 3 years she attended nursing school in Vancouver. After achieving her nursing degree (RN) from the VGH School of Nursing, Lesley spent most of her nursing career at Ridge Meadows Hospital as well as with Maple Ridge Home Health. Widowed 6 years ago, after 36 years of marriage, Lesley has 2 married children and 3 grandchildren.

Although Lesley doesn't have a formal background in electronics, amateur radio is in her genes. Her great uncle was a telegraph operator for CPR in the early 1900's. Lesley's father was a ham, having become interested in the hobby after suffering a back injury. Brothers Ken, Dave, and niece Renna are all hams as well. Lesley's dad's call sign was VE7CMI, and when he passed away, brother Dave took it on. Then when Dave moved out of BC, he eventually transferred VE7CMI to Lesley.

Looking back, Lesley has always been around ham radio. While camping, she remembers watching her dad set up his rig, using a rock to throw his antenna up into a tree. She also remembers her brother in the military talking with her dad – first by CW – then by voice. So, it was natural that when Lesley retired, she decided to pursue ham radio and join family members in the hobby. This she did, achieving her certificate in May 2023. Lesley found the course material quite daunting as she lacked an electronics background and physics was not her best subject in school. Lesley admits that the SARC course she took online had a steep learning curve. Fortunately, there was a lot of support from the instructors which happily continued after graduation.

Lesley soon joined both the Surrey club as well as the club in Maple Ridge and she says that both been extremely helpful and supportive. Lesley believes every new ham should join a club as it has really made a positive difference for her.

Lesley's family have been incredibly supportive as well, offering advice, loaning equipment, and helping her to set up antennas.

Lesley's equipment includes an iCom 7300 and a G5RV antenna. She did have a long wire antenna, but the squirrels chewed it in half, which may explain its sub-optimal performance. She also has a Yaesu FT-212 radio for 2 meters with a copper j-pole.

Currently, Lesley is taking the SARC CW course which she enjoys but finds challenging. Having family members with CW experience who offer support doesn't hurt. Lesley is also interested in POTA and has been out in the field once with a MRARC member, although she claims that down the road, she will be a 'fair weather' POTA operator once she acquires the appropriate gear. For now, she goes POTA hunting from the comfort of her ham shack (which doubles as her craft room.)

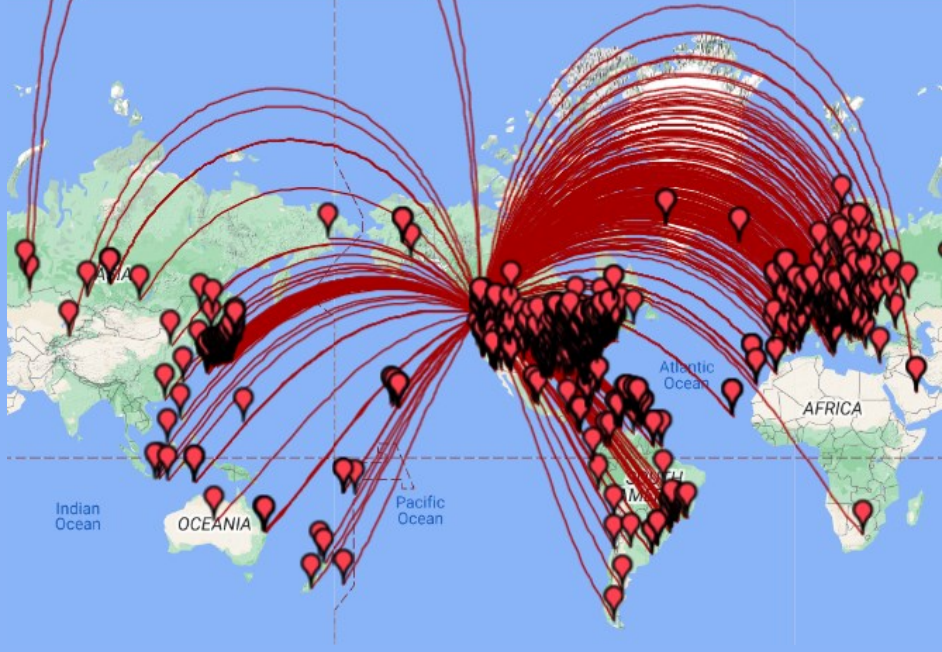
Lesley recently attended a SARC Soldering Workshop where she acquired skills entirely new to her. She hopes these skills will help her become comfortable with building her own antennas for POTA.

Lesley's other interests include quilting, knitting, paper crafts and gardening. Not surprisingly, she wishes there were more hours in the day! She considers herself incredibly lucky that her children and grandchildren live nearby, so she can enjoy time with them. Lesley also hopes that one day another family member with take up ham radio so that when she's gone the VE7CMI can be passed along and kept in the family.

Note: Lesley is a regular participant in many of the local area nets. You can usually hear VE7CMI asking pertinent ham-related questions on the SARC GOTA Net Thursday evenings beginning at 8pm.

~

The Contest Contender



CQ WW DX Contest (CW)

25-26 November 2023

by JOHN BRODIE VA7XB

JOHN BRODIE VA7XB reporting on SARC's contesting efforts.

A couple of the regular crew were committed to other contest stations and so unavailable to us for the CQ WW CW contest. Nevertheless we were able to achieve coverage for most of the 48-hour event with help of our regulars Jan VA7VJ, Dino VE7NX and John VA7XB and especially guest operator, Radomir VA7OO.

1168 Qs for 97 Countries were worked, almost DXCC! Best contact of the contest was ZS4TX in South Africa on 15m.

The station performed well, with no issues. We are noticing the benefit of having raised the wire antenna higher into the trees, as SE Asia, Oceana, and the Antipodes are now feasible for us at least on 40m.

Radomir VA7OO put in a full day, making 633 Qs

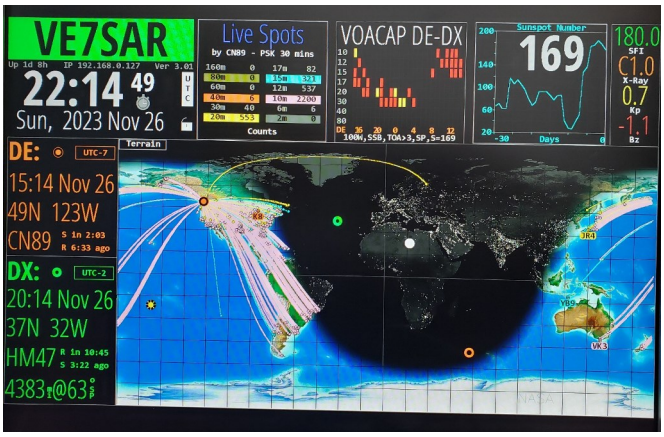
10 m was where the action was Saturday afternoon, thanks to high sunspot number. If you ever needed convincing that 10m is a "daytime" band, look at the pink lines in the image below … almost

all our contacts in early afternoon were to the west where the sun was still shining.

Coming up next are the following contests; whether you are a pro or just a beginner, you too can participate with as little or as much coaching as needed.

6-7 Jan	ARRL RTTY Roundup
13-14 Jan	NA QSO Party (CW)
20-21 Jan	NA QSO Party (SSB)
3-4 Feb	BC QSO Party (CW,SSB)
10-11 Feb	CQ WPX Contest (RTTY)
17-18 Feb	ARRL International DX Contest (CW)
24-25 Feb	NA QSO Party (RTTY)

~ *John VA7XB*



2	4W	Timor-Leste	3	27	EU	Belarus	3	52	LY	Lithuania	1	77	UA0	Russia AS	7
3	5B	Cyprus	1	28	F	France	12	53	LZ	Bulgaria	5	78	UN	Kazakhstan	1
4	5W	Samoa	1	29	FG	Guadeloupe	1	54	OA	Peru	1	79	UR	Ukraine	3
5	8P	Barbados	4	30	FM	Martinique	2	55	OH	Finland	8	80	V2	Antigua and Barbuda	3
6	9A	Croatia	7	31	FW	Wallis and Futuna	3	56	OJ0	Market Reef	1	81	V3	Belize	1
7	9M6	East Malaysia	1	32	FY	French Guiana	3	57	OK	Czech Rep.	9	82	V4	Saint Kitts and Nevis	3
8	9Y	Trinidad and Tobago	1	33	G	England	6	58	OM	Slovakia	2	83	VE	Canada	14
9	BY	China	2	34	GD	Isle of Man	1	59	ON	Belgium	4	84	VK	Australia	5
10	C3	Andorra	2	35	GM	Scotland	7	60	OX	Greenland	3	85	VR	Hong Kong	1
11	C6	The Bahamas	2	36	HA	Hungary	10	61	OZ	Denmark	2	86	W	USA	611
12	CE	Chile	3	37	HB9	Switzerland	1	62	P4	Aruba	3	87	XE	Mexico	4
13	CN	Morocco	3	38	HC	Ecuador	1	63	PA	Netherlands	4	88	YB	Indonesia	4
14	CO	Cuba	1	39	HK	Colombia	4	64	PJ2	Curacao	2	89	YL	Latvia	1
15	CT	Portugal	3	40	HL	South Korea	1	65	PJ4	Bonaire	4	90	YO	Romania	2
16	CT3	Madeira	4	41	HR	Honduras	3	66	PJ7	Sint Maarten	2	91	YU	Serbia	9
17	CX	Uruguay	2	42	I	Italy	14	67	PY	Brazil	23	92	YV	Venezuela	1
18	D4	Cape Verde	3	43	J3	Grenada	1	68	PZ	Suriname	3	93	Z3	North Macedonia	1
19	DL	Deutschland	22	44	JA	Japan	179	69	S5	Slovenia	11	94	ZF	Cayman Is	7
20	DU	Philippines	1	45	KH2	Guam	1	70	SM	Sweden	5	95	ZL	New Zealand	3
21	E7	Bosnia and Herzegovina	3	46	KH6	Hawaii	8	71	SP	Poland	13	96	ZL7	Chatham Is	1
22	EA	Spain	13	47	KL7	Alaska	5	72	TA	Turkey AS	1	97	ZS	South Africa	1
23	EA6	Baleares	2	48	KP2	Virgin Islands	1	73	TF	Iceland	3				
24	EA8	Canary Islands	3	49	KP4	Puerto Rico	5	74	TI	Costa Rica	5				
25	EI	Ireland	3	50	LA	Norway	3	75	TK	Corsica	1				

The Contest Contender

RAC Winter contest

30-31 December 2023

by JOHN BRODIE VA7XB

JOHN BRODIE VA7XB reporting on SARC's contesting efforts.

After making some recent changes to our station, and with the assistance of a few new operators, we were looking forward to the challenge of the 2023 RAC Winter Contest. As before, we had the use of a tri-band beam at 15m height and a 40-80m OCF dipole recently raised higher into the trees with expectation of improved night-time propagation and lower signal/noise ratio. RF was filtered through our diplexer/triplexer/bandpass filters to allow use of the same antennas on different bands simultaneously.

The operator lineup was comprised of Doug VA7JDJ, Mike VE7YEG, Kapila VE7KGK, Dmitry VA7DVO, Steve VE7SXM, Larry VE7LXB and John VE7TI on SSB, and Les VA7OM, Dino VE7NX, John VA7XB and Slawa VE7LWW on CW.

Once again we were using the callsign VE7RAC on behalf of Radio Amateurs of Canada in the Multi-Two category. This time we had the advantage of near kw capability using our own IC-7610/Expert Linear 1.5 plus a borrowed IC-7610/Acom 1000 amp. It was our plan to run highest possible power on both radios short of causing significant interference to the other station.

We were gratified to experience minimal RFI except when the CW station was on 80m and the SSB station was on 20m or 40m. The converse presented virtually no interference. Even CW reception on 20m was not adversely affected by SSB on 40m. These results are logical considering where the harmonic frequencies fall when operating in the CW v SSB portions of the bands.

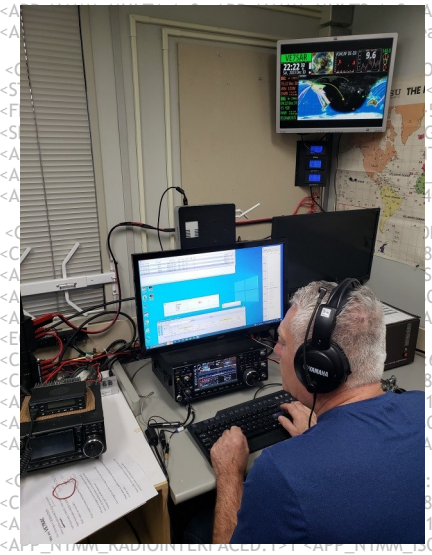
Predictably, activity on the low bands petered out late on Friday evening and continued slow early Saturday until around 8 a.m. when 20m opened up. Surprising was the amount of European DX competing in the contest which was able to break through the North American pileups with strong signals later on Saturday morning and early afternoon.

Good work, all. With 1551 contacts and a claimed score of 521,220, this was our best ever effort in the RAC contest.

~ John VA7XB

3.5	7	14	21	28	Total
0	0	25	72	0	97
1	30	1	30	0	62
0	0	27	198	119	344
3	0	51	114	54	222
82	80	263	0	0	425
0	0	19	46	0	65
0	0	70	4	0	74
0	0	40	112	0	152
0	3	66	32	0	101
0	9	0	0	0	9
86	122	562	608	173	1551

The results



Christmas Lunch

COME
HOME
SAFE

HAPPY NEW YEAR
2024

November 2023

SARC General Meeting minutes

November 8, 2023

Recording Secretary JEREMY MORSE VE7TMY

SARC General Meeting Minutes 23.11.08

Attendees: 27

Start Time: 7:00pm

Location: Surrey Fire Training Centre

Welcome

- Welcome by Steve McLean VE7SXM

Presentation

- **Scheduled Presentation by Les Tocko VA7OM:**
  Baluns – What are they? Why do we need them? How to build them.

Announcements

- Christmas Party on Dec. 2 11:30 a.m. will be potluck at the OTC. Spouses are invited. Coffee/Soft drinks will be provided. Anton to bring paper plates and disposable cutlery.
- Saturday Breakfast and OTC Open House Saturday mornings 7:30am – 9:30am at Denny's 68th and King George Blvd. OTC to follow from 10 am. to 12 pm 5756-142nd St.

Committee Reports

Financial Report (Steve VA7SXM)

- Balance Sheet & Profit/Loss sheets presented. We have almost finished our move away from HSBC to Coast Capital.

Nets (Reg VA7ZEB)

- New script has been tested and will be updated on the website soon. Reg to email Jeremy a new script.
- SEPAR net script will be piloted by Andrew.

SEPAR (Gord VA7GK)

- Encourages anyone interested in hosting the SEPAR net.
- Surplus Sinclair VHF/UHF antennas at Surrey Fired turned over to SEPAR.

OTC (Gord VA7GK)

- Debris was cleaned from the roof in recent weeks.
- Container in the parking lot has been removed, which means the SE anchor for the mobile tower had to be relocated.
- Long wire antenna was re-positioned higher in the nearby trees.

GOTA (Larry VE7LXB)

- Monthly announcements sent to memberships in newsletter called "SARC Buzz." sarcbuzz@ve7sar.net
- 47 active GOTA members at this time.
- Next GOTA workshop will be Sat Jan 13th. 3 people have signed up so far.

Membership (John VA7XB)

- 113 members in good standing, with approx 15 been dropped off the membership list for non payment of dues

Contests (John VA7XB)

- CQ WW contest last weekend and had several new contesters. 10 operators SSB.
- Nov 25/26 CQ WW CW team is being prepared
- Dec 30 RAC winter contest will be looking for operators. John B to ask Keith Witney for use of the RAC callsign.
- Wire antenna has been raised higher than it was before. Signal-to-noise appears better but we will test it out with a contest soon.
- 2m QSO party Nov 11 - Andrew
- North American Sprint Nov 11 - Andrew
- Repeater roundup VHF contest - John S.

Repeaters (Horace VA7HXB)

- 220 repeater info that was in error was updated in repeaterbook.com.

Ham Class for 2023 (John VE7TI)

- Finished the class last Mon. 5 people wrote their exams last night.

CW Class Sept 19th (Stan VA7NF)

- Exams postponed for 2 weeks.

Old Business

- Talents and Resources Questionnaire - expect to see an email on this shortly

New Business

- QSL Bureau needs contact person
- RAC insurance application required by year-end.

Adjournment at 9:37 pm.

~ Minutes prepared by Jeremy Morse VE7TMY

SARC news…

The Amateur Radio Digital Communications Grant Evaluation Committee

Congratulations go to SARC member Kevin McQuiggin VE7ZD/KN7Q. Kevin has been selected as a member of the ARDC Grant Evaluation Committee.

The ARDC (https://www.ardc.net/) funds technology projects and educational programs for amateur radio. They also fund research and studies on the social side of the hobby, for example studies about why people join the hobby, leave the hobby, how amateur radio can influence career decisions, and similar.

The grants last year totalled US$5M so this is a serious foundation. Once a grant is awarded then there are reporting requirements (typically an academic style paper) on what the project was about, what was done and how it turned out. One does not have to be "academic" to get grants and write papers, the whole point is to help amateur radio advance and continue to contribute into the future. The Board understands clearly that people with great ideas often do not come from academic or professional technical backgrounds.

Kevin's role is to work with a team of about eight other hams to review grant applications and find the ones with the best ideas. Those applications then go forward to the next stage where they are considered for funding.

Kevin says that: "I am certain that there will be lots of great opportunities for an active club like SARC in this. SARC could help ham radio evolve and remain (or regain) technical leadership in some aspects of radio, although I will not be able to vote on a SARC proposal."

~

Our 2024 CW class has wrapped up the instruction portion and the class is now busily practicing their code. Two class members have already passed. We congratulate their effort.

Reprint Policies

These are policies for reprints from The Communicator, a bi-monthly journal about amateur radio and other topics published by Surrey Amateur Radio Communications (SARC).

This work is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License. All rights are reserved.

You may use articles authored by SARC members for your club newsletter or other amateur radio publication, provided that the purpose is non-commercial, you credit the author, and provide a link as follows: https://ve7sar.blogspot.com/search/label/SARC%20Communicator. If our article indicates it is from a source outside of SARC, we cannot transfer that right, and you must seek permission to re-publish from the original source. We appreciate being notified via email to communicator@ve7sar.net if one of our original articles has been re-printed elsewhere.

We welcome your comments and feedback

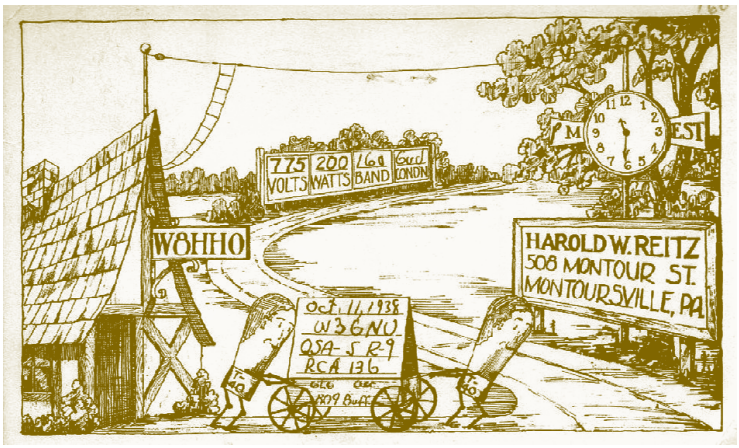
Please consider leaving a comment via email to communicator@ve7sar.net, or on our blog site https://ve7sar.blogspot.ca or, better yet, contact our authors directly, so they know someone is out there reading our publication.

Social Reminder

The Saturday weekly social gathering is once again 'on' at the Denny's Restaurant, 6850 King George Blvd., Surrey BC from 07:30—09:30. All are invited. Afterwards, we will host workshops and will be available to invigilate Amateur Radio exams at the OTC, 5756—142 Street, Surrey from 10-noon.

Bring your ham issues, our Elmers will try to help you sort them out.

About QSL cards



Amateur radio operators exchange QSL cards to confirm two-way radio contact between stations. Each card contains details about one or more contacts, the station and its operator. At a minimum, this includes the call sign of both stations participating in the contact, the time and date when it occurred (usually specified in UTC), the radio frequency or band used, the mode of transmission used, and a signal report. The International Amateur Radio Union and its member societies recommend a maximum size of 3.5 by 5.5 inches (90 by 140 mm).

Although some QSL cards are plain, they are a ham radio operator's calling card and are therefore frequently used for the expression of individual creativity—from a photo of the operator at their station to original artwork, images of the operator's home town or surrounding countryside, etc. Consequently, the collecting of QSL cards with especially interesting designs has become a frequent addition to the simple gathering of printed documentation of a ham's communications over the course of his or her radio career. There are some true works of art, comics, and historical events pictured on cards.

In Canada, as in many other countries, the QSL card tradition has continued to evolve with advancements in printing technology and design. Today, radio amateurs can create intricate and personalized QSL cards, often featuring high-quality graphics and photographs of their stations or notable contacts. The QSL card remains a symbol of the rich history and global network of amateur radio, reflecting the enthusiasm and passion of operators who strive to connect with others across the airwaves.

We may never know when the first "QSL" card was created. Undoubtedly, the QSL card tradition began when radio amateurs pressed the old penny postcard into service to acknowledge receiving a distant station or to memorialize a particularly intriguing contact. At about the same time radio was emerging, commercial postcards printed using lithography and containing photos and illustrations were becoming popular. It only made sense for radio amateurs to have some custom postcards printed featuring one's call sign, station details, and the like. Once a few radio amateurs did this, the "QSL craze" was well underway.

Early QSL cards provided eminently useful information. During the '20s, most stations were entirely homemade, and radio amateurs were quite curious to learn which "hook-ups" and antenna systems provided the best signal. As operating awards emerged in subsequent decades, the QSL card became a trophy to prove one worked a particular DX station or an uncommon state or province.

The exchange of QSL cards also fostered a sense of camaraderie among radio amateurs, creating a tangible connection between operators separated by vast distances. It became a cherished practice to display these cards, often adorning the walls of radio shacks or clubs, showcasing the diverse locations and contacts made by the operator.

Do you want to know more about how the QSL bureau works? Our BC QSL bureau has a website at: https://bcqsl.blogspot.com

~

SEPAR

Looking back on 2023

by GORD KIRK VA7GK

It is time again to look forward to a new year and also to look back at our learnings and successes in 2023.

What a good year 2023 was for renewing our SEPAR program.

Our radio community in both our Club (Surrey Amateur Radio Communications -SARC) and emergency program (Surrey Emergency Program Amateur Radio - SEPAR) have grown. We have had so many new ideas and opportunities we haven't been able to get to all of them.

Relationships and Community

Many of the areas of success an outside observer would say have nothing to do with the emergency program. Some of the activities by design are just fun. (Annual Foxhunt, Parks on the Air, Christmas Potluck etc.) However, one of our biggest successes is the growing community of amateur radio operators.

In emergency management it is often said "relationships are key", "it is not what you know but who you know". We are seeing that many individuals with diverse backgrounds being willing to help and contribute to SEPAR. This ensures we have a successful core group to work in and on the Emergency Program.

I have heard comments from many of our people about how happy they are to have found our radio group in Surrey. They have found a community.

Gord Kirk VA7GK is a SARC Director and the SEPAR Coordinator

Regular Meetings

Weekly we meet for Breakfast at a local Denny's restaurant. Each week there are between 15-20 individuals coming with a core attendance of about 12 every week. After this we move over to the OTC (Operations and Training Center) with many other different individuals coming there. Some weeks we run a class, others we build a project (thanks Dino VE7NX for leading this) while at the same time having some participate in contest using the radio stations.

We are very fortunate to be able to offer licensing classes throughout the year. The students also get a one-year membership in SARC to participate in the activities. This helps bring them into our community building relationships, introducing them to the SEPAR program. It also helps them get on the air. We are seeing volunteer numbers in the Emergency Program increasing almost monthly.

At our breakfast often the emergency program is discussed and what we need to work on next is planned. At breakfast about 6 weeks ago we talked about the Radio Room we have at Fire Hall 1 (where the cities EOC is located). Since COVID it has only been active about once per month to test the Inter-Municipal Emergency Radio System (IMERS). This has been led by Ron VE7VTA for the last couple of years. The Winlink Station was very old and some of the radios had been disconnected, with the HF station to have a known issue with the HF antenna.

Another couple of SEPAR members, Ion (VE7NL) and his son Jean Luc (VA7JLU) have also give their time to try and keep our Winlink stations active and support our documentation plans. Ion has spent hundreds of hours working on a documentation manual and with renewed support from others we hope that this can be expanded and completed.

So, a few weeks back a group went over for a visit and things then really began to move along. A list was made, and whirlwind of activity began. It started with checking which radios would work, connecting antennas etc. and trying to rebuild an accurate list of frequencies that would be programmed into all the radios. Horace VA7XHB took the lead on this. (He also is the person who helps program radios with the same list on Saturday mornings for people who come to the OTC). This frequency list is coordinated with surrounding municipalities and has many of the area repeaters and simplex frequencies. Reg VE7ZEB set up a Trello group to communicate tasks and their status.

He recently sent out a couple of email detailing the work by so many individuals and has given me permission to share (edited versions) as part of the report:

Fire Hall 1 Radio Room

Email #1:

Everyone,

I'm sending this email out after having a chat with Gord at the SARC meeting tonight. The topic is the SEPAR radio room at Firehall 1 which has fallen into a state where it could use some attention. The immediate goal is to get everything in that room working.

Gord, as discussed, I've sent this to the people I thought appropriate, but if others should be included, please reply to all and add them to the list.

Computer

Status:

The new video cable was deployed, and the computer now boots, and one can log in correctly.

Radios

Status:

- Radio 1: Powers on, no tail on the repeater, no response to radio checks. Unknown if this is functional.
- Radio 2: Does not power on.
- Radio 3: Powers on but is not set up for regular repeaters. Marked digital.

- Radio 4: Working and tested.
- HF Radio: not tested but it does power up.

Tasks:

1. We need to get all five radios working.

Misc

Erika fixed the clocks. She put a new battery in each and correctly set the UTC and Local times.

This is an amazing radio room, and we are lucky to have it. Horace is already working on programming the Icoms. If anyone else wants to play a more active role in getting this facility more functional, please let Gord know and/or reply to all in this email.

Several of us (Gord, Erika, and myself for now) are tentatively planning to visit Firehall 1 after breakfast every Saturday for the foreseeable future. Everyone is welcome to join us and I would be happy if you do. This should happen at approximately 9:30 a.m. and the goal of these informal meetings will be to do small tasks right then and there, and to set out a handful of tasks for the coming week. If a few people give the room half an hour now and then, this will become one of the best radio rooms in the city.

If you can, make it on Saturday after breakfast, that's great and I look forward to seeing you there. If not, expect another email after Saturday, at which point I should have more detail on exactly what needs to be done to get the radios working.

Best,

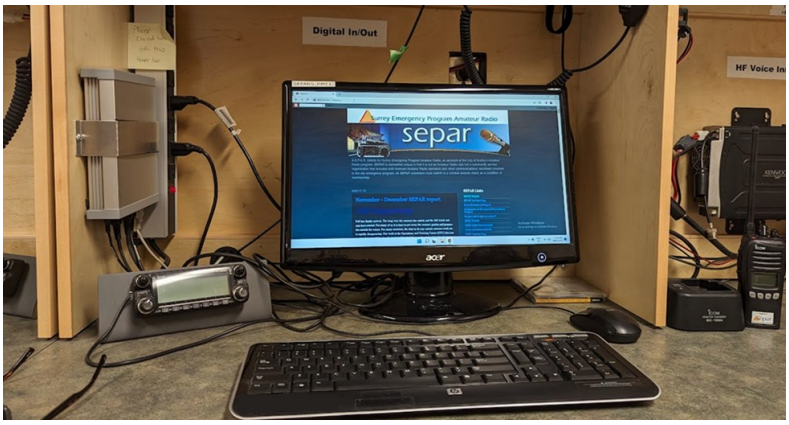
Reg VA7ZEB

Email #2

Everyone,

It's hard to believe my first email to the group was only 2 and a half weeks ago. Much has been done. Trello is our place to participate in the ongoing discussion on this, but I'm sending out this email update as I know some of you aren't following the Trello yet.

I got the Windows 11 computer working and on the Internet. Feel free to use it as needed for SEPAR matters.



Horace got all the Icom 2820 radios programmed. We called out on every single repeater and asked for signal reports. Every repeater that didn't at least trigger was dumped from the list, as there's no reason to have repeaters programmed in that you can't reach. Some repeaters had users report that we were unreadable, and those repeaters were dumped, too. At some point I would like to get a mobile radio programmed in with all those frequencies and take it out of the firehall to test if we are getting a clean signal in. Again, there's no point in having repeaters programmed which we can't communicate on.

Manvir (VA7BKI) installed the shelf and cleaned up the HT situation totally. He really did a clean job of it, and it looks great. At some point, we need to figure out what we're doing with all those HTs, but that can wait for now.

Erika (VA7ISI) got the whiteboard looking new and we put up a little shelf for the markers, eraser and fluid.

Mike (VE7YEG) bought RT Systems for us at his own expense and is working on installing that and testing the antennas on each radio. He's also working with Rob (VE7CZV) to install software for the visually impaired, which I think is amazing.

I will leave the remaining to-do list on Trello, but I just wanted to acknowledge the great work people have done so far. The radio room is already usable in emergencies, which is a great accomplishment.

Best,

Reg VA7ZEB

Email #3

Everyone,

We had another great meeting at Hall 1 today. Erika (VA7ISI) and Adrian (VE7YEP) are heroes for doing a serious cleaning. There was a thick layer of dust on the top of the cabinets. It's gone. You can run your finger on the top of the cabinets now and it will come back clean. Every surface has been dusted and then wiped down with water and cleaner. They also spent a ton of time piling up candidates for storage/recycling which were taken to the OTC today. The room is spotless now, and no longer looks like a storage room. I might note that Erika has more energy than Adrian and I have combined.

Even the (previously) totally disgusting air vent has been cleaned and looks great now.

Jeannie (VA7QLT) and Erika also spent a lot of time pruning some of the papers for either retention, review, or disposal.

Rob has tested his braille reader and that's working perfectly. Mike was invaluable in setting that up, too. I think it's amazing that we have an emergency radio room that is accessible to the visually impaired.

The Winlink station on the Toughbook has been taken down and Station A is now fully open for general use. All the junk equipment above the

cupboards has been taken down and either moved to the OTC for storage or has been placed somewhere accessible.

Jaspal's (VE7JB) donation of an air purifier should help to keep things cleaner in the future.

Erika really wants an electronic sign on the door. Doug (VA7JDJ) has agreed to investigate that and possibly take on the project if his investigation deems it feasible. Both Mike and Erika have ideas on the sign so I would suggest you communicate with them before starting anything, Doug. *[It's now completed]*

Gord and Stan are going to try to get the HF radio functional. That's the last non-functional radio in the room and I would absolutely love to get it functional so I hope this can become a priority. Gentlemen, I'm happy to help where I can, and I'd like to join you for the trip to the roof if possible as I have never been up there. When we're up there, I'd really like to document which VHF antennas belong to which radio.

Mike has done his Nano VNA testing. Mike's exact data will be up on our Trello shortly so if anyone sees any points of concern there, please let the group know.

Very importantly, after today, the vibe in the radio room has totally changed from being a storage room a couple of months ago to being a vibrant, active radio room in which everything (except the HF rig which we're working on) is fully functional and where a radio operator could work for many hours comfortably.

I doubt there will be another update until next year. I also don't expect any more Saturday meetings at Hall 1 until next year. Thank you all so much for the work you've put in. This is now one of the best radio rooms in the city. Next year, we'll update our procedures for the rooms use, so keep ideas on that flowing. Merry Christmas if I don't see you before then.

Best,

Reg VA7ZEB

We will continue to keep you updated on the work as there is still much to be done.

Over the past year there have been so many other things done by many not mentioned in this Hall 1 review. Steve (VE7SXM - President of SARC) and John (VA7XB SARC Vice President) both spent hours working on updating the SEPAR Trailer. John also went through each of the grab and go kits to ensure they were complete and noted any deficiencies requiring repair.

John VE7TI and Stan VE7NF both spent countless hours teaching the radio licensing course and subsequent workshops to assist students get licensed.

John VE7TI also coordinated the communications, emergency preparedness, and deployment plan for the 2nd annual September Run Surrey Run event. Our capabilities and professionalism has left a very favourable impression with the organizers and city staff.

Larry VE7LXB has been tireless in supporting the newly licensed with the Get on the Air (GOTA) Net and fielding so many questions from the newly licensed and asking for further help from the "Elmers" group when needed.

In the background we have Jeremy VE7TMY our Secretary who does such a great job with the paperwork and website maintenance, and Scott VE7HA our treasurer who so carefully looks after finances.

Lastly there are too many to call out regarding the OTC. We have help cleaning leaves off the roof, cleaning bathrooms, maintaining radio stations and antennas and so many little items.

As I started describing earlier it is the relationship and the community with regular meetings that have given the support for the SEPAR program to ensure a healthy vibrant volunteer program for the city.

I look forward to sharing what we will do in 2024.

I wish everyone a very Happy New Year.

Gord Kirk VA7GK
SEPAR Coordinator

separ
Surrey Emergency Program Amateur Radio

Regional Frequency Plan

Name	Frequency	Offset	CTCSS
VE7RSC (Primary Repeater)	147.360	+0.600	110.9
VE7RSC (Secondary Repeater)	443.775	+5.0	110.9
VE7RPT (Primary Regional Repeater)	146.940	-0.600	Optional 136.5 Rcve
Simplex 1	(VHF) 146.550		
Simplex 2	(VHF) 147.420		
Simplex 3	(UHF) 446.550		
Simplex 4	(UHF) 447.425		

Other frequencies in the Greater Vancouver area:

Primary: Coquitlam/Abbotsford 146.430
Primary: Inter-Municipal Group 3 146.445
Primary: Vancouver; Mission; Sec. Coquitlam 146.460
Primary: Kent-Mission; Sec. Richmond 146.475
Primary: Inter-Municipal Group 2 146.490
Primary: New West; Sec. Richmond 146.505
National Calling / FM Simplex Group I 146.520
Primary: North Shore; Port Coquitlam 146.535
Primary: Bowen Island; Surrey 146.550
Intermunicipal Group 1 Coordination 146.565
Primary: Lions Bay/Vancouver/Delta/Langley 146.580
Primary: Port Moody; Sec: Burnaby 146.595
Secondary: Vancouver/Surrey 147.420
Secondary: Vancouver (UBC) / Maple Ridge 147.450
Primary: White Rock/Chilliwack; Sec. No. Shore 147.480
Secondary: Burnaby/Pitt Meadows 147.510
Primary: Delta; Sec: Abbottsford 147.540
Primary: Hope; Sec: Delta; ALSO EMBC 147.570

Ham Leftovers...

HF Mini-beam

Possibly the most famous Ham Radio HF Mini-Beam ever conceived. A 65-year-old design that seems to have been forgotten by many! Peter G3OJV, takes you through the concept and highlights some ideas that you might want to incorporate in a self-build design. Although protected by Patent, you are permitted to build your own version of the G4ZU design for personal use. . You can watch a video about the antenna: https://youtu.be/hmSrTocLqCg

Splatter. What is is it? Why is it bad? How to avoid it

Have a look at the video: https://youtu.be/h-fKEswfC6Y

What happens when you put a adjustable loading coil at the base of a 10m hamstick?

Find out by watching this YouTube video: https://youtu.be/1yYcaGClXzI

Modern spark gap transmitter uses a rotary gap

In the "don't try this at home" category, Joe Smith builds a spark gap transmitter with a twist. The twist is that the drive power is from a signal generator attached to a FET. From there, though, things go classic using an automotive ignition coil and a tank circuit. He shows how adjusting the spark frequency changes the signal's sound in a standard receiver. The full story is at: https://hackaday.com/2023/12/11/modern-spark-gap-transmitter-uses-a-rotary-gap/

Directional ham radio antennas

When you think of directional ham radio antennas, you probably think of a Yagi, cubical quad, or a log-periodic antenna. These antennas usually are in a horizontal configuration up on a high tower. However, it is possible to build beams with a vertical orientation and, for some lower frequencies, it is far more practical than mounting the elements on a boom. [DXCommander] shows us his 40 meter two-element vertical antenna build.

The full story is on Hackaday at: https://hackaday.com/2023/12/05/directional-antenna-stands-tall/

The Abbree folding vertical handheld antenna

Another one of those cheap antennas on Amazon. Lots of our members have bought them, but is it any good? Before you buy one, check out this YouTube video: https://youtu.be/JntCqTS5yZE

We're QRT

Field Day is a team effort

It's not too early to start planning for 2024

by JOHN SCHOUTEN VE7TI

John Schouten VE7TI is a Director with Surrey Amateur Radio Communications

Are you one of those members who feels that you have been excluded from participation in SARC/SEPAR's Field Day (FD) because you are not one of the "ace" operators, nor a qualified candidate for the GOTA station?

Since Field Day is supposed to be a dress rehearsal for a real emergency where HF radio communication may be required on short notice, it is obviously an important event in the life of radio clubs. The approach in years past has been to put forth a competitive effort, have some fun and enjoy the socialization while making as many radio contacts as possible. More recently, partly the result of our closer relationship with the City of Surrey and the emergency program, the focus has shifted to a more demanding objective, i.e. to showcase emergency preparedness and demonstrate to the public and the response agencies that the skills required to set up complex equipment, operate it, and make radio contacts efficiently and accurately without external power have been learned well.

At FD 2023, it was demonstrated that even beginners, part of our extensive GOTA efforts, could make a big difference and could rapidly acquire the skills for long-distance HF communications. Our first place in Canada and third overall in the 2F (EOC) category proved that point. Because our counterparts in other parts of North America are doing the same thing, Field Day is, by design, a contest against ourselves and against others. The competitive nature of FD is a driving force towards performance excellence. In other words, this is primarily a skill-

testing and demonstration event with the "fun/social" aspects taking second priority. Ever wonder why we do the "bonus" events at the same time as operating radios? They are for the purpose of giving amateur radio more exposure to the public and to the response agencies and to encourage non-amateurs and new amateurs to get involved; naturally, bonus activities earn bonus points. This shift to a winning objective was a conscious decision of the SARC Directors several years ago; the impetus for the operator training program was launched about the same time, as it was apparent that too few of our members possessed the required operating skills to achieve top performance.

So if you are one of those who feels that Field Day is passing you by, give some thought to what effort ***you*** have made to participate. Here's how you can feel "included":

- If you are new to the hobby, take advantage of our GOTA training opportunities (contact GOTA@ve7sar.net).
- Join the Field Day core planning team and take on full responsibility for organizing and implementing a major component of FD.
- If you can't get involved in the full planning, then make it known that you are available to take on a specific FD task under direction.
- Join the operator training group to learn from the experts how to move from a mediocre operator to a skilled operator.
- Participate in as many contests as possible throughout the year to hone these skills. Remember, as long as you have qualified on the operation of our OTC station, you can work any contest that you wish, or even just come in and work some DX.
- Get your home HF station functional and practice what you have learned.

If fun and socialization are primarily what you seek, you may still find it at Field Day by joining the group which doesn't operate radios but instead assists with setup, takedown, bonus activities, or a support function. These non-operating activities are just as critical to our success as sitting at a radio and are excellent experience if we are faced with an emergency situation and are called out to help with radio communications.

Bear in mind also that, while FD is not primarily a social occasion, a number of other events during the year take place where fun and social activity are the main focus, e.g. the Christmas party, post-meeting socials, flea markets and swap meets, Fox Hunt barbecues, etc. And, if we have volunteers step forward to help carry the load of organization and execution, we can have other (fun and social) field operating events during the spring and summer where all participating radio operators have an opportunity to get on the air (e.g. Parks On The Air—POTA or Summits On The Air—SOTA, or the less competitive contests).

Field Day is, therefore, mainly about radio operation and performance. If you don't feel that this is the right objective for SARC, then I encourage you to step forward as a member of the Field Day core planning team and influence a change to your liking.

Having performed so well at previous Field Days, we now have a reputation to uphold and the competition will likely rise to the challenge of moving us lower on the list by a more aggressive effort on their part. Naturally, we are going to try to improve our score going forward. Please consider the large number of contests scheduled throughout the year as an opportunity to train and qualify in future years. But also keep in mind that we rely on the dedicated group of volunteers to pitch in and take on the many supplementary tasks that fulfill the public education component and make it possible for others to make the radio contacts. We hope you will be one of these willing team members.

Field Day is less than 6 months away. It's not too early to start planning now.

~ John VE7TI
with inspiration from John VA7XB

SARC SOCIETY DIRECTORS

2023-2024

PRESIDENT
Steve Mclean VE7SXM
president at ve7sar.net

VICE PRESIDENT
John Brodie VA7XB
vicepresident at ve7sar.net

SECRETARY / WEBMASTER
Jeremy Morse VE7TMY
secretary at ve7sar.net

TREASURER
Scott Hawrelak VE7HA
treasurer at ve7sar.net

DIRECTORS

Gord Kirk VE7GK
(SEPAR Liaison)
SEPAR @ ve7sar.net

Larry Bloom VE7LXB
New Ham Coordinator
GOTA @ ve7sar.net

John Schouten VE7TI
(SARC Publications/Blog/Social Media & Courses)
communicator at ve7sar.net
course at ve7sar.net

Stan Williams VA7NF

SARC MEMBERSHIP & CONTEST MANAGER
John Brodie VA7XB
membership at ve7sar.net

SARC QSL MANAGER
(pro tem) John Brodie VA7XB

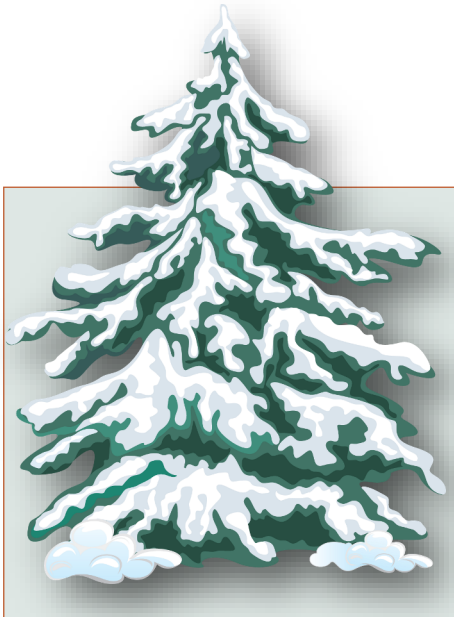
SARC REPEATER MANAGER
Horace Bong VA7XHB
repeater at ve7sar.net

SARC NET MANAGER
Reg Natarajan VA7ZEB
net at ve7sar.net

A look back…

From The Communicator—February 2014

Past Communicators are available at:
https://ve7sar.blogspot.com/search/label/SARC%20Communicator
or search the complete Communicator contents & index at:
SARCindex



January and February

Here we are in a new year and lots of amateur radio activities.

We start off the new year on January 10, with a Zoom presentation by Kevin McQuiggin VE7ZD/KN7Q on GNUradio. You too can build radio, SDR and other circuits on your computer using only an inexpensive RTL USB dongle as the hardware component. Kevin did a hands-on workshop for us a few years ago and it was fascinating. Have a look at his 'Radio Ramblings' and a GNUradio article this month on pages 14 and 62.

SARC hosts an Amateur Radio net each Tuesday evening at 8 PM. Please tune in to the VE7RSC repeater at 147.360 MHz (+600 KHz) Tone=110.9, also accessible on IRLP node 1736 and Echolink node 496228.

On UHF we operate a repeater on 443.775MHz (+5Mhz) Tone=110.9 or IRLP Node 1737.

*We have a '**Get On The Air**' net directed at new hams on Thursday evenings at 8pm, on our 2m repeaters: North: 147.360MHz+ Tone=110.9Hz and South: 147.360MHz+ Tone=103.5Hz. Our SARC Elmers will be on hand to answer your questions.*

	SARC Net 20:00 Hrs
1st Tuesday **Standby**	Gary VA7GPR Reg VA7ZEB
2nd Tuesday **Standby**	Andrew VA7LGN Sheldon VA7XNL
3rd Tuesday **Standby**	Larry VE7LXB REG VA7ZEB
4th Tuesday **Standby**	Kapila VE7KGK John VA7XB
5th Tuesday **Standby**	Reg VA7ZEB John VE7TI
Want a turn at Net Control? Contact the SARC Net Manager	

Down The Log…

SARC Monthly Meetings

2nd Wed. (Sept-Jun)
1900 hrs at the Surrey Fire Service Training Centre, 14923 - 64 Avenue, Surrey, BC. Here is a what3words link and map: https://what3words.com/markers.addiction.ozone

Weekly SARC Social

Saturday between 0730 and 0930 hrs at the Denny's Restaurant, 6850 King George Blvd., Surrey BC

Workshops

Saturday between 1000 and Noon at the OTC 5756 142 Street, Surrey

SEPAR Net

Tuesday at 1930 hrs local on 147.360 MHz (+) Tone=110.9

SARC Net

Tuesday at 2000 hrs local on 147.360 MHz (+) Tone=110.9

VE7RSC Repeaters

2m North: 147.360MHz+ Tone=110.9Hz
IRLP node 1736
Echolink node 496228

2m South: 147.360MHz+ Tone=103.5Hz Fusion capable; No IRLP/EchoLink

1.2m: 223.960 Mhz -1.6 Tone=110.9Hz

70cm: 443.775MHz+ Tone= 110.9Hz
IRLP node 1737
WiRES-X Room ID 00047

We Have A SARC Patch!

These are suitable for sewing on a jacket, cap or your jammies, so you can proudly display your support for the club.

The price is $4 each or three for $10 and they can be picked up at a meeting or the weekly Koffee Klatch.

Please Support RAC

Radio Amateurs of Canada (RAC) is the national association for Amateur Radio in Canada. It is a not-for-profit membership association with headquarters in Ottawa, Ontario, Canada, representing the interests of Amateur Radio all across Canada.

Speaking on behalf of Canadian Radio Amateurs, RAC provides liaison with government agencies and carries the Amateur voice about regulatory and spectrum issues to the discussion table with government and industry leaders, nationally and internationally. RAC is the Canadian voting member society of the International Amateur Radio Union (IARU).

RAC also provides many services, publications and supplies to its members to enhance their enjoyment of Amateur Radio.

We thank our sponsors for their SARC support.

Please support them.